VOLUME 27 NUMBER 10

OCT 4 1940

The Journal

OF THE

AMERICAN DENTAL ASSOCIATION

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Tissue Changes—*Skillen*

Silicate Cement—*Paffenbarger*

Dental Caries—*Bradel and Blayney*

Facial Features in Diagnosis—*Lischer*

Securing Correct Impressions—*Wright*

Endemic Dental Fluorosis—*Clawson et al.*

Temporomandibular Ankylosis—*Bellinger*

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OCTOBER 1940

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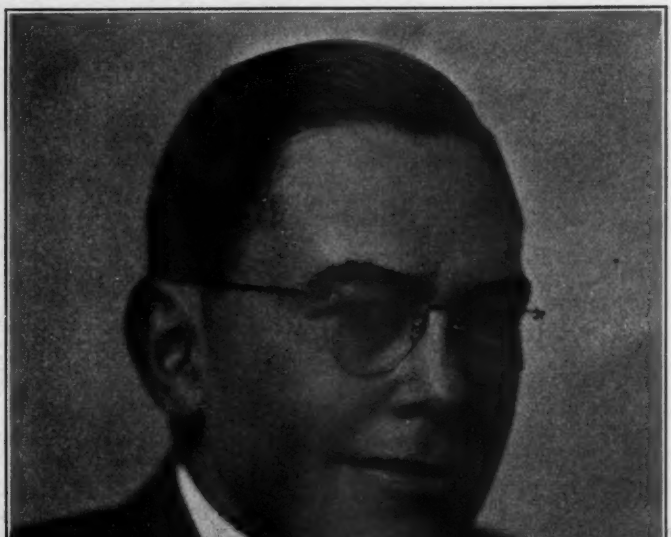

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President Elect of the American Dental Association

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IMPORTANCE OF THE FACIAL FEATURES IN DIAGNOSING DENTAL ANOMALIES AND MUTILATION

By B. E. Lischer,* D.M.D., St. Louis, Mo.

I. THE ART OF DIAGNOSIS

THE development of diagnosis forms an important chapter in the history of the healing arts. When one reviews this chapter, one learns that many of the diseases and deformities with which dentistry and medicine have to deal date back to antiquity.

Although many symptoms of disease were recognized in ancient times when doctor and priest were one, when dentists "wandered from fair to fair practicing their trade in booths," the aim of the practitioner then was to determine the outcome of the patient's ailment.

For centuries the symptoms, especially the chief symptom, constituted the disease for the physician as well as the patient. Headache, fever and dropsy were considered diseases in themselves. Our language retains an occasional evidence of this conception in such names as consumption and jaundice.[1]

Pioneers in dentistry who attempted correction of dental anomalies called them malposition of the teeth and their efforts were almost entirely directed to the elimination of the chief symptom, such as malposition of a maxillary incisor or canine. The phrase "malposition of the teeth" was changed to "irregularities of the teeth" as more symptoms, that is malposition of other teeth in more remote places of the jaws, were recognized. In the last decade of the nineteenth century, these expressions gave way to the new term "malocclusion of the teeth," and diagnostic classifications based on ideal occlusion were accepted as a final achievement in the diagnosis of dental anomalies.

During all these years, extreme deformities of man's denture were often referred to in a casual manner or entirely ignored, and the recognized forms of "malocclusion" were usually described as mere occlusal deviations of the teeth.

*Professor of orthodontics, Washington University School of Dentistry.

Read before the Section on Orthodontia at the Seventy-Fifth Annual Midwinter Meeting of the Chicago Dental Society, February 16, 1939.

But as the number of specialists in orthodontics increased, methods of treatment of extensive malformations by using extramaxillary anchorage or by resorting to radical surgery were devised. In reviewing the evolution of our therapy, one learns that "progress in cures was the outcome of failure to cure, and failure to cure meant, likewise, further study and revision of ideas of ailments."[2]

Improvements in our methods of diagnosis as well as of treatment were thus deliberately planned so that we might interpret all dental deformities and their symptoms objectively and quantitatively and thus enhance the value of our prog-

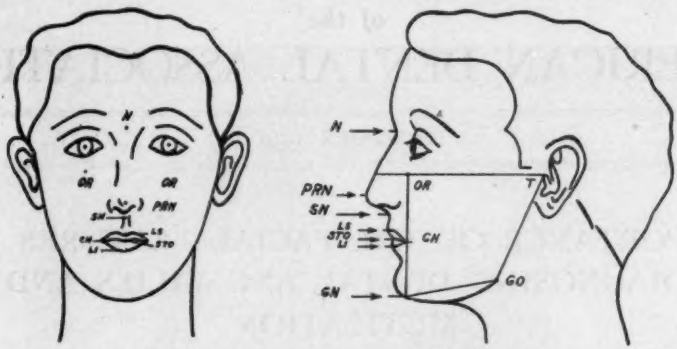

Fig. 1.—Important facial measure-points and symbols.

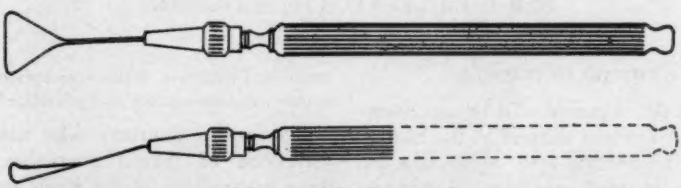

Fig. 2.—Orbital marker.

Fig. 3.—Photostatic record of mandibular growth during two years of orthodontic treatment.

noses and render our treatments more effective.

II. THE FACE IN DIAGNOSIS

Man has pictured his face in a variety of ways, and, in poetic moods, has expressed his admiration in romantic fash-

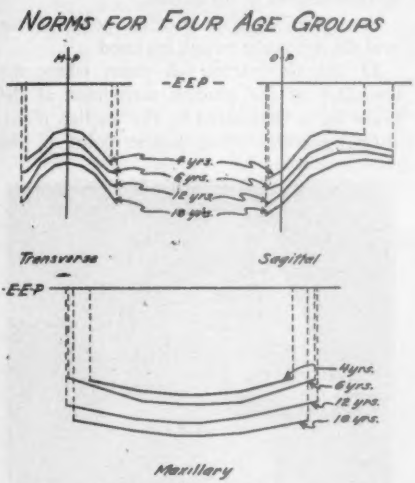

Fig. 4.—Three-dimensional norm patterns for four age-groups.

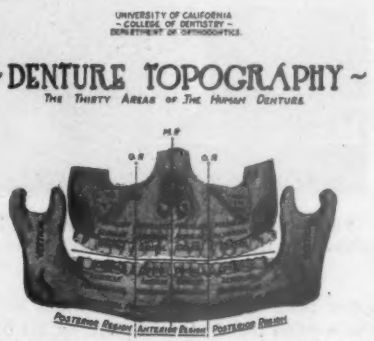

Fig. 5.—Topography of denture described by Simon. (Drawing by F. W. Schubert.)

ion. For many, the face is an aspect of life which cannot be defined. Thus, an idealist prefers "to linger on the threshold without investigating the internal dimensions of the oral cavity" or contemplating its proportions and relationships.

Now it has long been known to dentists that the teeth bear an important relation to facial expression, that certain facial deformities are caused by anomalies of the teeth and jaws and that dental treatment of anomalies and mutilation often cures the associated facial malformation. The dependent relationships

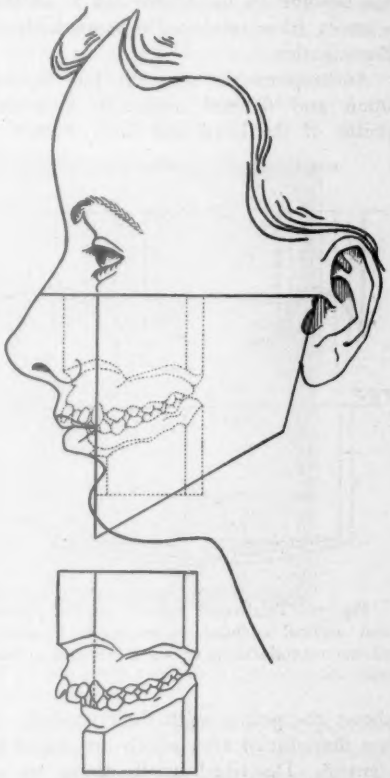

Fig. 6.—Relationships of gnathostatic denture reproduction. (Drawing by J. D. McCoy.)

between the teeth, jaws and face have thus been perceived for many decades, but suitable methods for evaluating these relationships were not available until 1922.[8] It is these interconnections which we wish to consider.

Such basic sciences as embryology and

anatomy have provided a sound foundation for the critical study of the face and its organs. Physical anthropology and photography, which began their development as sciences about the time that the first dental college was founded (1838-1839), have, like dentistry, undergone a similar rapid growth. Anthropometry, the art of measuring the parts of the human body, and photography, which has become an invaluable aid to all the sciences, have produced new methods of investigation.

Anthropometric research has agreed upon and defined numerous measure-points of the head and face. Figure 1

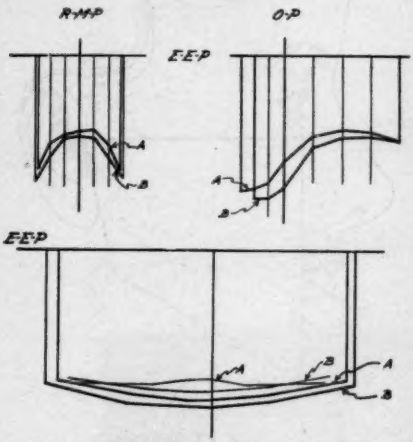

Fig. 7.—Transverse palatal, sagittal palatal and vertical occlusal curves made from the plaster reproductions shown in Figures 11 and 12.

shows the points, with their symbols, of the dentofacial area which are useful to dentists. Described briefly these are as follows[4]:

N. *nasion*—The point at the root of the nose which is intersected by the median sagittal plane. The root of the nose corresponds to the naso-frontal suture, which is not necessarily the lowest point on its dorsum, and which can usually be located with the finger.

Prn. *pronasion*—The most prominent point on the tip of the nose when the head is placed in the eye-ear (horizontal) plane.

Sn. *subnasion*—The point of the angle between the septum and the surface of the upper lip. We seek it at the point where a tangent applied to the septum meets the upper lip.

Ls. *labrale superius*—Point of the upper lip lying in the median sagittal plane and a line drawn across the boundary of the mucous surface tangent to the curves.

Sto. *stomion*—The median point of the oral slit, when the mouth is closed.

Li. *labrale inferius*—A point where the boundary of the mucous membrane of the lower lip is intersected by the median plane.

Gn. *gnathion*—The lowest point in the

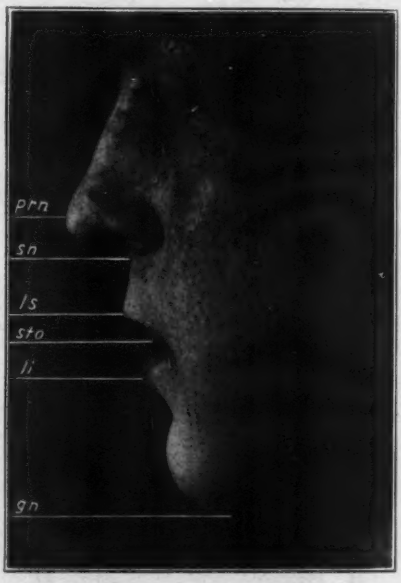

Fig. 8.—Portions of profile line divided into sections for study.

lower border of the lower jaw which lies in the median plane. It is a point on the bony border palpated from below and naturally lies posterior to the tegumental border of the chin.

Or. *orbitale*—The lowest point in the margin of the orbit (directly below the pupil when the eye is open and the patient looks straight ahead), which may readily be felt under the skin. The eye-ear plane passes through the orbitale and tragion.

T. *tragion*—The notch just above the tragus of the ear. It lies 1 to 2 mm. below the *spina helicis*, which may easily be palpated.

Go. *gonion*—It is the lowest, posterior and most outward everted point of the mandibular angle. (In palpating the point, the patient is cautioned not to turn his head to right or left, but to look straight ahead.)

Ch. *cheilion*—The lateral terminus of the oral slit; the so-called outer corner of the mouth.

The beginner is cautioned to exercise care in locating the various points. Accuracy can readily be acquired with practice. Numerous articles in the literature show carelessness in this respect. In marking the *orbitale*, or eye-point, with a skin pencil (dermatograph), the instrument shown in Figure 2 is helpful. It consists of a loop of stainless steel wire 0.8 mm. (20 gage B&S) thick, soft-soldered into a customary broach holder. (Suggested by Dr. Sly, of Boston.) For marking the *gonion*, I have found a soft lead wire 15 cm. long and 1.30 mm. thick (16 gage B&S) a valuable aid when molded over the posterior and lower margins of the mandible. With the wire held in place with the left hand, the point can be marked with the right hand.

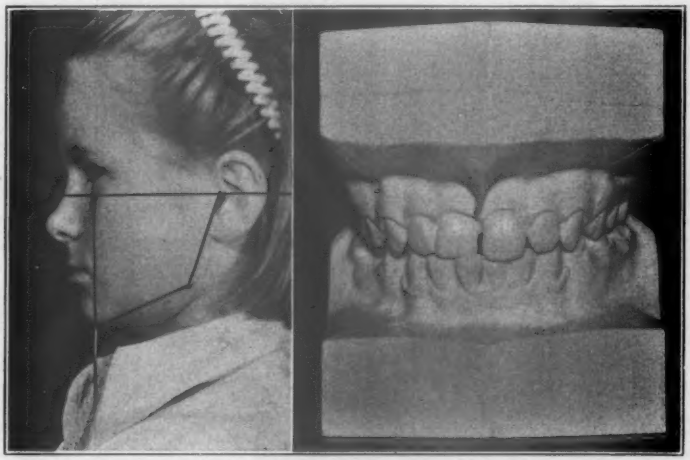

Fig. 9.—Eugnathic dental anomaly; so-called "simple malocclusion."

Photostatic photography, as applied in the diagnosis of dental anomalies and mutilation has been adapted to our special requirements so that

> . . . all photographs of the same individual (taken at various intervals, Fig. 3) and of different individuals are taken under the same exact conditions. . . . The error of refraction occasioned by the perspective of photographic projections is reduced to a minimum by selecting a lens with long focal distance and reducing the size of the image (to one-fourth natural size). This source of error is further minimized if we subject the photostatic pictures to the same measurements and comparisons; consequently all of them (because of this minute exactitude) present the same minimal error.[6]

The occasional disapproval concerning the purpose and value of photognathostatic data is due to a surface understanding, which finds it easier to ignore fundamentals; for, in a truly critical study of all elemental conditions, one soon learns to appreciate the value of measurements, and to concede that "science approaches its ideal in the degree that it can express its data in number relationships."

III. PHOTOGNATHOSTATIC METHODS

These methods were designed by

Simon to determine the position of a given living denture in the head and to enable one to accurately differentiate between malposition of individual teeth and malformation of the alveolar processes, jaws and facial features. To do this in an acceptable manner, one must measure denture relations in three dimensions. By using the horizontal, median sagittal and transverse orbital planes of the head, one can attain a satisfactory result. Since these planes must show a definite mathematical correlation, it was found advantageous to always place them at right angles to each other.

and showed how biometric norm-patterns could be obtained with the aid of these methods and subsequently applied in the diagnosis of dentofacial deformities. (Fig. 4.) These patterns were procured from adequate groups of living children and adolescents with anatomically correct dentures, and are not based on a "thoroughly fanciful metaphysics," such as is implied in the phrase "Nature's plan." It is time that we realize the impossibility of demonstrating the existence of eternal types in external nature.

Anomalies do not always affect the entire denture, and if such an extreme con-

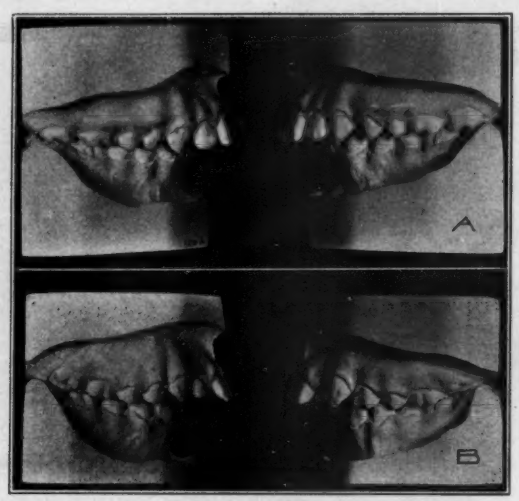

Fig. 10.—Customary denture reproductions of two cases of so-called bilateral distoclusion.

Owing to variation, there are no fixed measure-points, natural planes nor permanent relations on any living form; hence, modern science rejects the old belief in ideal forms, including the ideal occlusion of the teeth. "The normal represents a certain range of individual variations advantageous to the species; departures outside this range (are disadvantageous) . . . and fall within our concept of disease"[6] (and of deformity). Simon fully recognized this fundamental postulate of present-day science

dition presents itself in a given case, its individual parts are variously affected. Hence, it is desirable to fix the locale of the several malformations. To facilitate this localization, Simon[7] recommends a common agreement on definite boundaries by using the thirty areas shown in Figure 5.

In addition to a case history, which should contain much pertinent information, it is essential to procure other indispensable diagnostic data from every patient; namely, dental roentgenograms,

photostatic facial reproductions, gnathostatic denture reproductions and three-dimensional graphs made from the last.

Facial deformities associated with dental anomalies and mutilation frequently offer diagnostic data of value and should not be regarded as unimportant. Customary plaster denture reproductions do not record these data; hence, it is helpful to preserve authentic evidence of these facial malformations. (Fig. 3.)

Photostatic facial reproductions and gnathostatic denture reproductions (Fig. 6) are based on sound principles and are made in a very definite way, recording the relationships between the denture and head and showing the deformities of the jaws. They have metric value for diagnosis and prognosis and are not art objects or show pieces.

Three-dimensional graphs (Fig. 7) made from gnathostatic denture reproductions enable one to note the symmetry, or asymmetry, of the transverse, sagittal and vertical relations of a given denture by comparing them with a *norm* (Fig. 4) and permit us to evaluate the nature and degree of the malformation. An experienced diagnostician may find it unnecessary to draw curve diagrams for each case, but Simon wisely advises them as a routine for the beginner in his first fifty cases, so that he may "form the habit of not trusting mere observation and subjective opinion too freely, because it is not invariably easy to fully comprehend all that an objective examination of the reproductions reveals."

IV. FACIAL SYMPTOMS

In many dental anomalies and cases of mutilation, certain facial features disclose malformation and obviously their measure-points exhibit disturbed relations. These external symptoms present a large group of important diagnostic signs to the trained clinician.

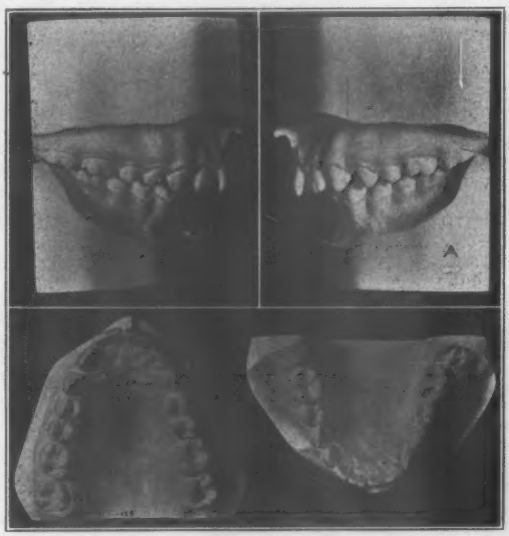

Fig. 11.—Gnathostatic reproduction of denture shown in Figure 10 A.

In addition to observing the disturbed relationships of such measure-points as the subnasion, both labrale and the gnathion to the orbital (perpendicular) plane, it is an advantage to divide at least a portion of the profile line into sections. (Fig. 8.) The profile bound-

aries of these sections usually manifest themselves as curves (not straight lines), and we analyze their form, length and inclination.

1. *Anomalies.*—Many dental anomalies, especially between 4 and 10 years of age, consist of malposition and malocclusion of the teeth with only occasional mild involvement of the alveolar processes and no malformation of the jaws. I have previously suggested that the word "eugnathic" *(eu,* meaning well, and *gnathic,* from *gnathos,* meaning jaw) be used to designate this relatively large group, because the prognosis in most instances is favorable and their treatment is seldom difficult. (Fig. 9.)

Whenever the jaws and contiguous facial features show distortion, it is helpful to immediately and tentatively classify such an anomaly as "dysgnathic" *(dys,* meaning ill, bad or difficult); for the diagnosis is always more complicated and the prognosis more doubtful than in eugnathic cases. In such instances, it is advantageous to procure all the indispensable diagnostic data mentioned above. For example, Figure 10 shows customary plaster denture reproductions of two cases of so-called bilateral distoclusion (Class II, Division 1, Angle). Even a superficial examination of such an anomaly instantly reveals marked malformation, and the accompanying facial deformities are always manifest to patient and parent.

The gnathostatic denture reproductions of these cases (Figs. 11 and 12) to the trained eye reveal marked differences, but they do not make possible an appraisal of the patients' faces. This critical study for diagnostic purposes can, however, be made from the photostatic facial reproductions of the same patients. (Fig. 13.) Profile A records a marked prominence of the subnasion and cheilion, which is due to the anterior position of the entire maxillary dental arch, and especially to the fact that the long axes of all these teeth are rather perpendicular to the eye-ear plane (top surface of the maxillary reproduction), and ap-

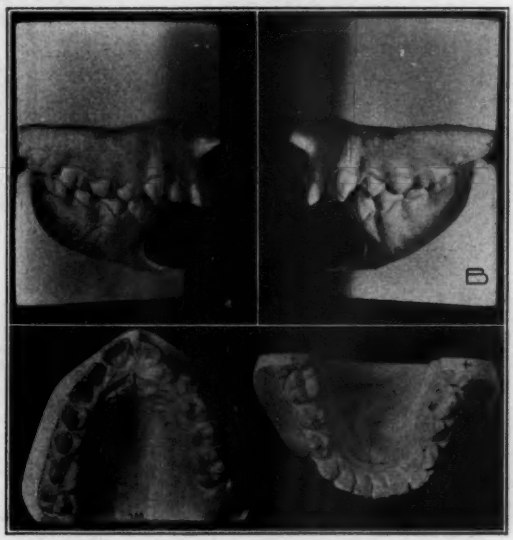

Fig. 12.—Gnathostatic reproduction of denture shown in Figure 10 B.

proximately parallel to the orbital plane, which denotes a total dental and alveolar protraction in the maxilla. We also observe a normal position of the gnathion, and the lines gn-go-t are substantially equidistant, which indicates a well-

traction in the mandible. The latter is verified by the abrupt mentolabial sulcus shown in A, Figure 13, and the posterior position of the mandibular teeth in relation to the orbital plane, Figure 11, occlusal view of the lower denture.

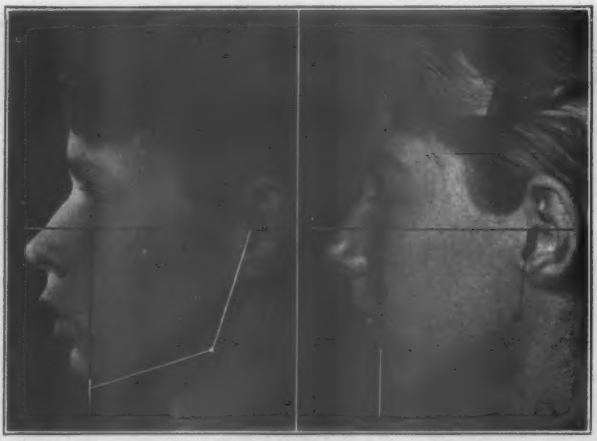

Fig. 13.—Photostatic facial reproductions of cases shown in Figure 10, A and B.

Fig. 14.—Total mutilation with eugnathia.

developed mandible in both corpus and rami. The complete bilateral distoclusion is due to the protraction mentioned above and to a total dental and alveolar re-

Profile B, Figure 13, reveals a gnathion too far posterior in its relation to the orbital plane, and, in tracing the lines gn-go and go-t, we observe a marked

arrest of development of the rami, which indicates a total mandibular retraction. Not only is the prominence of the maxillary incisors (Fig. 12) less in degree than in the previous case (compare the sagittal curves in the graphs shown in Figure 7), but also the long axes of the incisors diverge from the orbital plane; i.e., are not parallel to it, which means a coronal or dental protraction of these teeth. Thus, we note that the diagnosis of these two anomalies differs considerably; hence, our mechanotherapy should not be identical. This significant conclusion was reached by a more critical evaluation of the important facial features of the two patients.

Fig. 15.—Partial mutilation of anomalous denture with mandibular retraction.

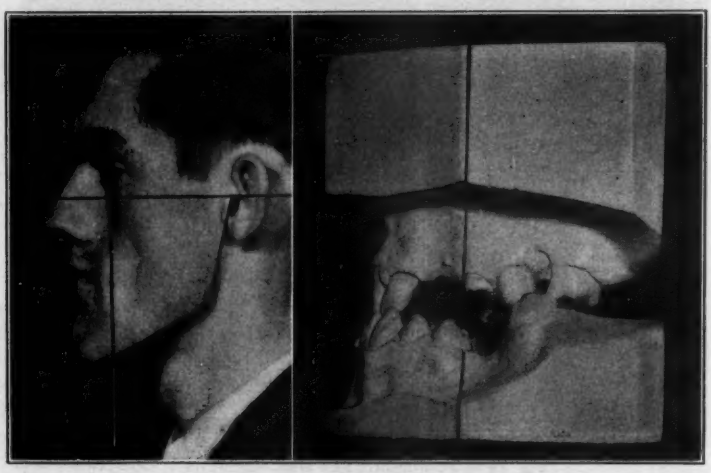

Fig. 16.—Partial mutilation of anomalous denture with mandibular protraction.

2. *Mutilation.*—Although partial mu-

tilation of man's denture begins at a very early age, owing to the high incidence of dental caries, total loss of the teeth in adults is not of the same frequency as anomalies in children until the sixth decade of life. Total loss of teeth is an old affliction, however, and the development of the art of replacing them preceded orthodontics. Greater proficiency in oral health service may some day achieve prevention of many anomalies and thus contribute to the reduction of mutilation, but, up to the present, the latter may be said to have been the chief concern of prosthetic dentistry. It is generally accepted as inevitable and its etiology does not receive critical study in prosthetic case records.

The service rendered by prosthetic dentistry has been esteemed for esthetic as well as for utilitarian reasons. Deformities of the face caused by loss of teeth have been recognized for many decades, but the value of facial symptoms in diagnosing mutilation has not received the recognition which their importance merits.

Of the many persons who, because of rampant caries and its neglect, acquire a total mutilation, a considerable number originally had well formed jaws with good alinement and occlusion.

Figure 14 shows dental and facial reproductions of an edentulous person after a prosthetic restoration. In addition to providing satisfactory masticatory function and greater accuracy of articulation to the voice, the artificial dentures also restore the facial proportions. The latter requirements are more readily determined by using photognathostatic methods, since the early recognition of the *eugnathia* is a factor of consequence in the diagnosis and prognosis.

Figure 15 shows dental and facial reproductions of an anomalous denture already severely mutilated, and it is easily seen that, in contemplating restoration, the dentist has to consider the total mandibular retraction. The arrest of development so plainly evident in the lower jaw cannot be corrected by any form of prosthetic service, though the condition probably modifies the plan of procedure.

Figure 16 shows another partial mutilation which undoubtedly had been an anomaly since early childhood. Complete loss of teeth now would tend to reduce the sagittal length of the alveolar process in the maxillae, but the body of the mandible would still present a total protraction, unless the condition is corrected by the surgeon. If surgical means is declined by the patient, it is obvious that the occlusion of artificial teeth, which might later be inserted, would have to take into consideration the original deformity.

Figures 14, 15 and 16 have been supplied by my colleague in the prosthetic division of the Washington University School of Dentistry, Dr. Tom Moore, whose employment of photognathostatics has demonstrated that it is an invaluable aid in dental prosthetics.

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TISSUE CHANGES THE RESULT OF ARTIFICIAL STIMULI AND INJURY

By William G. Skillen, D.D.S., Chicago, Ill.

In all phases of dentistry, it would appear that some injury is necessary, and that the final effects of any injury may be more or less uncertain. But it would seem that a knowledge and a full appreciation of the injuries that may arise and the conditions behind them should tend to make us ever more careful to soften the blow, to move more slowly and cautiously. Oppenheim[1] recognized the situation when he said that all the work done in orthodontia is a violence to nature and that, not being able to avoid this, we can only try to cause the least possible amount of damage. This statement may well apply to all branches of dentistry.

With the initiation of more orderly and more scientific attempts to rearrange teeth in esthetic and functional order, interest began to center more definitely around the characteristics of the structures involved and the manner in which they adapted themselves to new situations.

Flourens,[2] in 1842, seems to have been the first to understand definitely that a change in the position of teeth was associated with resorption and building of bone. A much more complete demonstration of this fact, together with what may occur during the change, was given by Sandstedt,[3] in 1904 and in 1905, a work which seems to have been given little mention and which was curtailed by his death. Sandstedt was followed by Oppenheim in 1911 and again in 1935. His two contributions, covering both animal and human material, afford a wealth of material for study. During this period, many others have, in various ways, added to our knowledge of the subject. But there is still much to learn; for, as Oppenheim[1] has said, a description of single details occurring during the course of treatment does not exhaust the variety of happenings, because "where life is active, one cannot expect the same results, even under apparently similar conditions."

Those structures in which we are chiefly interested at the moment are the gingivae, the peridental membrane, the alveolar process and the cementum.

Orban[4] and Oppenheim[1] have considered the latter three structures an inseparable unit, in which an alteration or injury to one is likely to have an effect on the others. In a certain sense, this is true, but to my mind there is only one controlling structure, one dictator, as it were, and that is the peridental membrane. Changes in bone or cementum are dependent on changes taking place in the former tissue even though these may be invisible, rather than the reverse being true. This holds even when the gingival changes appear to be the leading causative factor in the condition, for it should be remembered that the peridental membrane forms an integral part of that structure, and, as Noyes[5] has shown, its circulation is continuous with that of

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the rest of the peridental membrane and the bone.

To a certain extent, the changes and injuries which occur in the tissues surrounding the teeth may be the same under physiologic as under artificial stimuli. The simplest of these is the so-called biologic stimulus which is present during the growth period, when teeth are altering their position to take their permanent place in the mouth. (Figs. 1, 2 and 8.) These changes, which may occur on all surfaces of the teeth, reflect the type of movement affecting the teeth—tipping, horizontal or occlusal, or a combination of two or more.

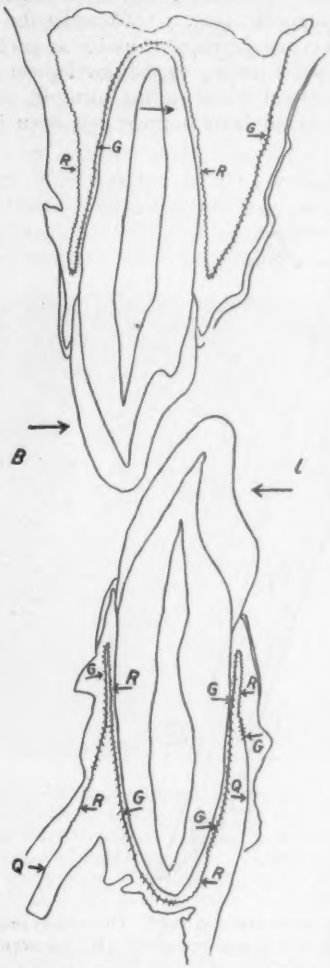

Fig. 1.—Biologic lateral movement of human upper incisor and tipping of lower, in 12-year-old child. The arrows indicate the direction of movement. The scalloped outline (R) indicates resorption. The cross-lines (G) indicate bone building.

The essential features of such biologic movements are bone building and bone resorption without the least noticeable injury to the tissues. The former change appears on the tension side, where the peridental membrane fibers are drawn taut; the latter on the relaxed, usually referred to as the pressure side. In connection with these changes, however, there also takes place a balancing resorption on the one hand, and a balancing building on the other, in the process of which the functional amount and arrangement of bone are maintained. While resorption or building is taking place on the peridental membrane surface of the bone, changes are taking place on the outer surfaces of the process or in the medullary spaces of the bone, or both. (Figs. 1 and 13.) In this way, a new bony process is slowly built up and rearranged to meet the requirements of the new situation.

This is the natural, or biologic process, emphasized by Schwartz[6] as that which should be established if possible, but which, under artificial stimuli, seldom is. Oppenheim,[1] indeed, seems to believe that it is impossible to attain, and his material bears out this belief. Stuteville[7] apparently has been able to establish the natural process in at least two instances, under different circumstances; once, when the tooth being moved was not in occlusion and again when it was in occlusion. (Figs. 3 and 4.) It would be interesting and valuable to know whether this type of movement could be more consistently attained and under what circumstances.

However, it would seem that nature itself is not always perfect, for even under conditions which may be considered natural and biologic, injuries sometimes occur closely paralleling those induced artificially. (Figs. 5 and 6.) These injuries, apparently the effect of occlusal or muscular stress, consist of compression atrophy of the peridental membrane and tooth resorption.

membrane itself may not be arranged to successfully resist stress. During the development and eruption of adjacent teeth, much of the intervening bone may be lost, this adding to the weakness of the support. (Fig. 7.) Consider the use of the first permanent molar as anchorage when, owing to the development of the second molar or the bicuspid, some part of its bony support has been lost.

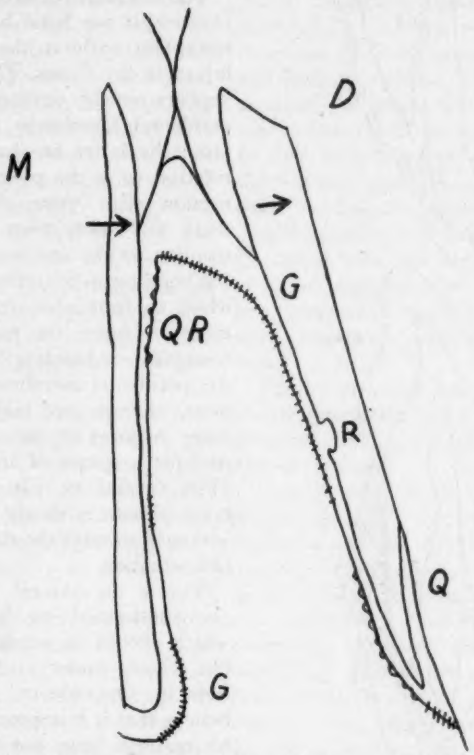

Fig. 2.—Lateral drift and tipping of human incisors in 12-year-old child. The arrows indicate the direction of movement, a physiologic movement in which root resorption (R) has occurred. (Compare Fig. 6.)

It should be recognized that all of the supporting structures of the teeth change with time. At first, the teeth have a rather delicate and weak support, not reaching full maturity and strength until a relatively late period, perhaps as late as 20 or more years. The peridental

The same condition may also exist in the deciduous dentition where root support is being lost.

These fundamental weaknesses of the supporting structures may well account for many of the injuries incurred under artificial stimuli. Perhaps they may also

account for the damage which is described as being the result of so-called jiggling and which seems to occur so frequently. Inasmuch as orthodontic treatment generally is conducted during these periods when the supporting structures have not quite reached their full strength, it would seem wise, if too great injury is to be avoided, to consider this matter carefully.

Under artificial stimuli or stress, two things may happen to the peridental membrane: The membrane may be torn (Fig. 14), as has been experimentally shown to occur in the dog during separation of teeth[8] and in the same animal under orthodontic stress, but which as yet has not been demonstrated as taking place in the human dentition; or, as is more commonly the case, the membrane on the pressure side may undergo compression and atrophy, just as, it has been pointed out, is possible under natural circumstances. (Fig. 9.)

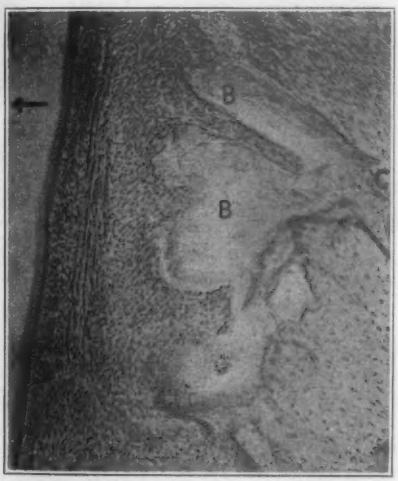

Fig. 3.—Biologic orthodontic movement of human bicuspid, tension side. The arrow indicates the direction of tipping. B, new bone on peridental membrane side. C, resorption on outer surface. (Compare Fig. 4.) (After Stuteville.)

That tearing of the peridental membrane does not seem to occur in the human being, or at least is not readily discernible, may well be due to the fact, as just described, that this tissue is more flexible during the average treatment periods and will, therefore, give instead of tearing. It would seem that the principal difference between animal and human tissue in this respect is that the former is usually more mature and therefore less resilient when experimental work is conducted on it. Only the end-result of healing of the torn peridental membrane has been studied and, at this stage, nothing is visible but a normal appearing tissue.

The compressed and atrophied areas of this tissue are gradually removed through the action of giant cells and replaced by granulation tissue. A definite hyperemia is usually present around these areas, even extending to the bone spaces. The final healing leaves a normal-appearing structure. To date, nothing has been found which appears to correspond to the angioma-like arrangement described by Oppenheim.

Tooth resorption is usually an accompaniment of the crushing of the peridental membrane. (Figs. 10, 11 and 12.) Resorption usually includes more or less of the dentin, but, in general, is not very extensive in any one area. Such areas apparently are repaired rather rapidly on the release of pressure and the development of granulation tissue. (Fig. 12.) Root resorption seems to be an integral part of the repair process involved in the removal of the dead tissue adjoining it. It has been stated that ischemia and hyperemia are closely related to or control bone resorption or building. If this is true, it should also apply to cementum.[9] Why, under apparently similar conditions, root resorption occurs in some instances and not in others (Figs. 9 and 10) is still a problem, unless it can be explained on the basis of the character of the circulation of the part.

Fig. 4.—Opposite side of Figure 3; resorption on relaxed side of peridental membrane at crest. The arrow indicates the direction of movement. O, osteoclasts. B, bone building in medullary space. There is no root resorption.

As has been indicated, bone changes occurring under artificial conditions may be similar to those occurring under natural circumstances; but, in the former, more adverse conditions may arise, which might be regarded as pathologic. Such a condition might be one in which a fracture of the bone occurs (Fig. 14), or one in which, because of either excessive pressure or failure of a balancing replacement to take place, an excessive amount of bone is lost. (Fig. 11.)

Fracture of bone has been demonstrated in the animal as taking place during separation of teeth as well as under orthodontic force (Fig. 14), probably because the fibers proved to be stronger than the bone to which they were attached. This does not seem to occur in the human being, or at least to date has not been demonstrated, probably again because of the greater flexibility of the human peridental membrane during the period of treatment.

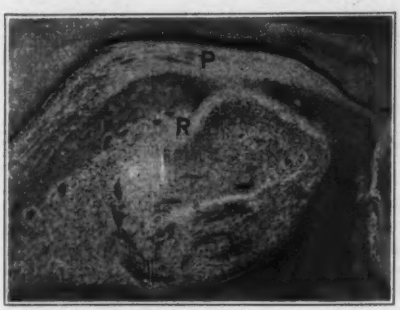

Fig. 5.—Compression atrophy (P) of peridental membrane in bifurcation of molar shown in Figure 6. R, undermining resorption from medullary space. There is no tooth resorption.

Excessive loss of bone seems to occur

Fig. 6.—Old compression area (P) on the side of incisor of 12-year-old child, with resorption (R) of tooth. C, new cementum of repair. B, overgrowth of bone. (Compare Fig. 2.)

Fig. 7.—First and second molars of 8-year-old child. R, loss of bone on mesial and distal aspect of first molar as result of close proximity of adjacent teeth.

more commonly at the crest of the process (Fig. 11) under tipping stresses, or in the interproximal areas during rotation of teeth. (Fig. 10.) The repair picture

Fig. 8.—Erupting upper incisor of 8-year-old child. P, compression area. During these periods, the supporting structures are very delicate.

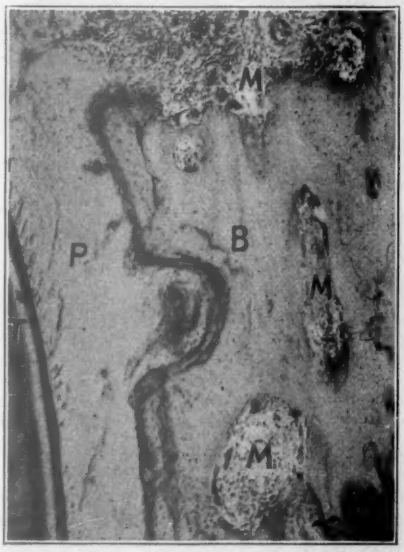

Fig. 9.—Rotation of tooth by orthodontic means. P, compression atrophy of peridental membrane between tooth (T) and bone (B). M, undermining resorption of latter from medullary spaces. O, osteoclasts. There is no tooth resorption.

of such conditions has not as yet been described.

Although injuries to the structures so far discussed can perhaps be readily repaired, leaving no lasting defects, recovery from injury to the gingivae is more uncertain and the outcome more problematic. Contrary to the view of Stuteville,[7] such injuries should be considered as rather serious.

These injuries may have varied causes. Even careless gingival exploration or a rough prophylaxis may cause them. The injuries that result from the use of various appliances in orthodontic treatment have been described.[10] Some of these may leave no appreciable mark, if the separation of the epithelial attachment is not considered important. However, more frequently, they may leave a permanent defect, which may slowly develop into something worse. (Figs. 15 and 16.)

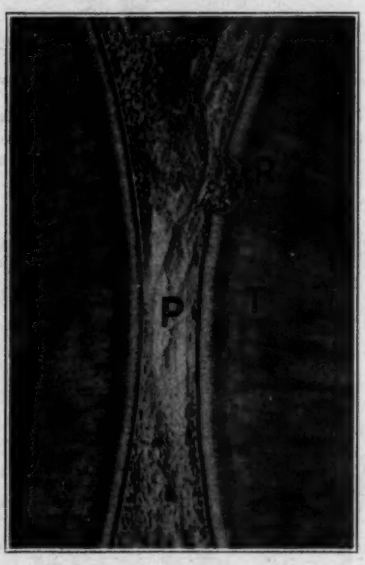

Fig. 10.—Rotation of tooth by orthodontic means. P, compression atrophy of peridental membrane between two teeth (T) with complete loss of bone from area. R, tooth resorption.

Often, these injuries are not limited to the gingivae alone, but also leave their mark on the underlying structures. Inflammation of these parts has a tendency to cause resorption of bone and sometimes of the tooth root. If the stimuli already applied have set up bone resorption, such an inflammation will certainly augment the process, and may lead to loss of an excessive amount of bone. Furthermore, it may prevent that balancing osteoblastic action necessary for the maintenance of the required amount of bone. Perhaps this kind of thing accounts for too great a loss of bone in the crest region. Thus, the whole process of change and repair may be altered, delayed or permanently upset. Considering

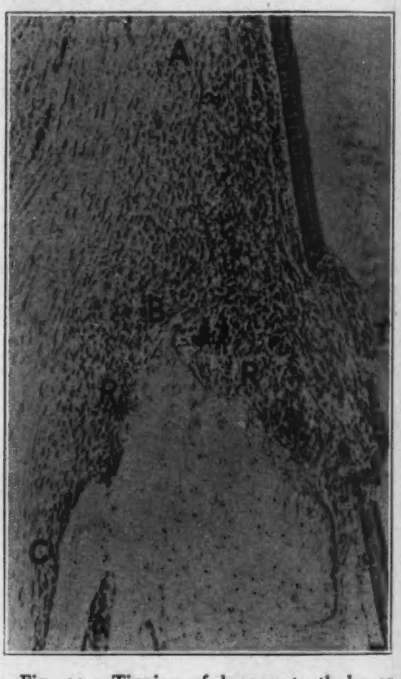

Fig. 11.—Tipping of human tooth by orthodontic means; loss of alveolar crest from A-B, with resorption of the bone continuing at R. T, tooth resorption. C, bone building. (After Stuteville.)

the gingivae as the protective cap, as it were, of all the other investing tissues, and in view of their vulnerable position in the mouth, these structures, above all else, should receive the most careful consideration.

SUMMARY

It has been shown that, usually, under the most natural biologic stimuli, that of growth and eruption, bone changes are correlated with the movements of the teeth. During these changes, a balance is maintained between the resorption and building processes and thus a functionally necessary amount and arrangement of bone structure are maintained.

However, at times, pathologic conditions may arise, even under the foregoing conditions, and apparently as the result of occlusal or muscular stresses. These conditions resemble somewhat

Fig. 12.—Tipping of human tooth by orthodontic means; period of recovery from injury. G, granulation tissue. C, repair by cementum deposit of resorbed tooth surface. O, osteoblasts on surface of bone. (After Stuteville.)

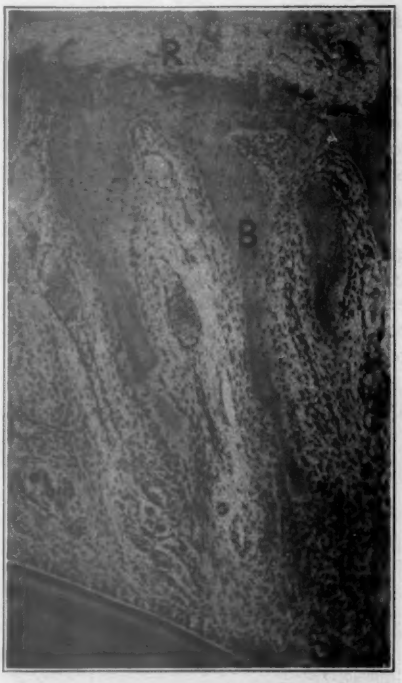

Fig. 13.—New bone formation (B) during orthodontic rotation of tooth, with balancing resorption taking place (R) in a medullary space.

Fig. 14.—Fracture of alveolar process during separation of teeth. F, fracture area. T, torn peridental membrane.

those resulting from artificial stimuli.

Such injuries consist of one or more of the following: crushing and atrophy of the peridental membrane; tearing of the peridental membrane; resorption of the tooth root; fracture or excessive loss of bone, and, perhaps constantly, more or less permanent injury to the gingivae.

All injuries except those affecting the gingivae seem to heal readily, with apparently no functional defect, but recovery of the gingivae and the possible untoward effects of their injury are much more problematical.

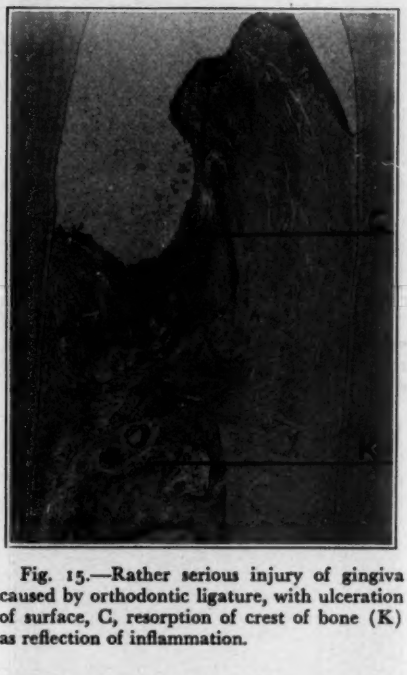

Fig. 15.—Rather serious injury of gingiva caused by orthodontic ligature, with ulceration of surface, C, resorption of crest of bone (K) as reflection of inflammation.

It has also been pointed out that during those periods when orthodontic treatment is likely to be conducted, the investing tissues are relatively delicate and weakly supportive. This may account for the rather severe injuries which arise during treatment, as well as those which occur at times under natural stresses.

During resorption and formation of bone on the peridental membrane sides of the alveolar process, changes of an opposite character take place on the outer surfaces of the process or in adjacent medullary spaces, or both. In this manner, the required functional amount and arrangement of bone are maintained.

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Fig. 16.—Unhealed gingiva some weeks after removal of orthodontic ligature. R, resorption of crest of bone.

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TEMPOROMANDIBULAR ANKYLOSIS AND ITS SURGICAL CORRECTION

By DON H. BELLINGER, D.D.S., Detroit, Mich.

FROM a therapeutic standpoint, temporomandibular ankylosis occurs in two forms: (1) that in which the pathosis is within the joint and (2) that in which the pathosis is entirely outside the joint. In the first, or intra-articular type, there is alteration of the joint structures with a fibrous or actual bony fusion of the parts. If there is a bony fusion, it is permanent, and intra-articular fibrous adhesions have a tendency to be transformed into a bony fusion. The disease may involve one or both joints, this depending on the etiology. Curiously enough, even in bony ankylosis, absolute immobility is rare. This is especially true if the ankylosis is unilateral. While the one joint may be absolutely immobile, attempted opening of the jaw produces a gliding motion toward the opposite joint, which seems to cause some motion, in all likelihood, more apparent than real.

Extra-articular, or false, ankylosis is caused by pathologic lesions outside the joint proper. Generally, it is due to a formation of strong fibrous adhesions, which limit the movement of the joint without causing ankylosis. The loss of function is never complete and it is not transitory as in hysteria or in muscle spasm.

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ETIOLOGY

Intra-articular, or true, ankylosis is due to infection or trauma. The infection may be confined to the joint or it may have arisen in neighboring structures and involved the joint secondarily. Acute pyogenic infection of the middle ear or the zygomatic extension of the mastoid, osteomyelitis of the mandible, especially in children, and suppurative lesions of the parotid may all cause varying degrees of joint involvement. Compound trauma, whether mere perforations or compound fractures, will, if infection develops, give rise to suppuration, with resulting joint damage.

Suppuration arising in and confined to the joint generally creates an exit through the tympanic plate into the external auditory meatus, where it may be mistakenly diagnosed as otitis media. Because of the slow evolution of ankylosis, it is possible that many more cases arise from a suppurative joint than is generally supposed.

Fracture of the condyle may cause ankylosis of the joint, but the fracture must involve the joint surface. Crush-

ing blows to the area of the joint are more likely to cause an ankylosis than blows to the mandible with resultant fractures at the condylar neck. The latter may result in some loss of function, but rarely in ankylosis.

It is not at all uncommon for the temporomandibular joints to become involved in chronic atrophic arthritis. Owing to the great amount of cartilage entering into the structure of the joint, namely the two articular surfaces and the intervening meniscus, all of which act as a protective mechanism, it is one

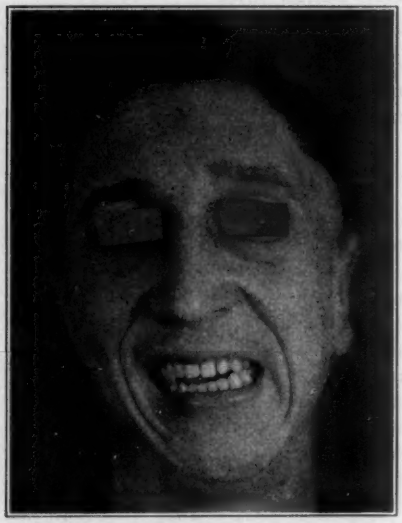

Fig. 1.—Characteristic facial deformity from unilateral bony ankylosis. The jaw deviates to the affected side, which is full and round, but shortened. The unaffected side is flat.

of the last joints to become involved. The pathology of an involved joint in chronic atrophic arthritis is that of a peri-articular and intra-articular involvement of the joint structures in an inflammatory process, accompanied by pain, palpable tenderness and loss of motion. There is a definite synovitis with effusion into the joint. The cartilaginous structures gradually become involved and are destroyed, being replaced with granulation tissue.

True ankylosis never occurs in hypertrophic arthritis. While erosion and destruction of joint cartilages occur, there are also marked thickening and obliteration of the marrow spaces of the articular ends of the bones, resulting in conversion of the bone end to osseous tissue of equal or greater density than normal cortical bone. Stimulated by the friction of the exposed bone ends, the new solid structure becomes highly eburnated and secondary changes in the joint are set up. These changes are characterized by alteration of the articular surfaces, increase in the circumference

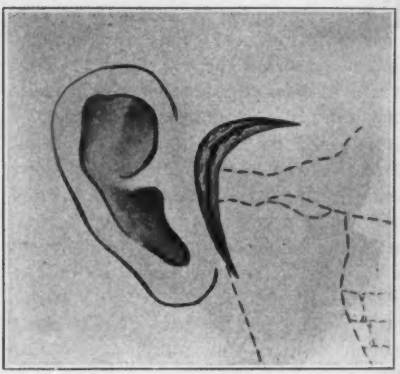

Fig. 2.—Incision for approach to temporomandibular joint. The first incision is made only through the skin, which is dissected back and retained with a suture through the skin of the face. Further dissection requires care to preserve the branches of the seventh nerve.

of the articular head of the bone, pain and nodular enlargement (Heberden's nodes), but, as previously stated, ankylosis does not occur.

Rest, physiotherapy and judicious movement, with elimination of trauma to the joint surfaces from malocclusion, will go far in preventing extensive joint change and damage. Extra-articular, or false, ankylosis is seen in tetanus and hysteria, and as a reflex effect of pain

from an inflammatory process in the mouth, ear, throat and parotid gland. Scar formation, following trauma and surgical interference, may limit the action of the jaw to varying degrees, but never by the production of a true ankylosis.

PATHOLOGY

The nature, sequence and duration of the tissue changes which lead to bony ankylosis have been experimentally studied by Allison and Brooks.[1] Four methods were used by them: (1) partial excision of the joint; (2) destruction of the joint cartilage; (3) injury to the joint cartilage, and (4) direct infection of the normal joint. From their experiments, they concluded:

> Any inflammatory process within the joint which is of sufficient severity to result in the formation of granulation tissue will destroy the joint cartilages. The cartilage is absorbed at its margin by granulation tissue from the synovial membrane and at its base from granulation tissue in the bone marrow. . . . Ankylosis by bone is a slowly developing process which consists of the following stages: First, there is union by granulation tissue; second, there is union by fibrous tissue; third, there is a metaplasia of fibrous tissue into fibrocartilage, and a direct transformation of this tissue into bone. The shortest period of time in which complete bony ankylosis was observed experimentally was 180 days. In man, the duration of the process is equally prolonged. . . . The idea that the interposition of soft parts prevents bony ankylosis is misleading.

Almost any degree of bony fixation may be found at the time of operation. Obliteration of the sigmoid notch, with bony union of the coronoid process as well as the condylar process, is not uncommon. It is well to determine as far as possible the extent of the ankylosis before planning the operative procedure. In some cases, this is quite impossible, and whether condylar resection or complete osteotomy of the ramus is necessary can be determined only by direct exploration.

In extra-articular, or false, ankylosis, the pathologic process varies in all cases with reference to extent and location. Strong scar bands displacing the normal tissue of the cheeks both intra-oral

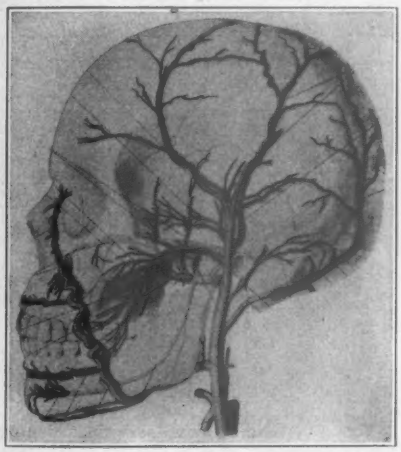

Fig. 3.—Schematic drawing of superficial blood vessels of head. (Sobotta-McMurrich.) By careful dissection, the superficial temporal nerve is preserved. The transverse facial nerve is cut and tied.

Fig. 4.—Masseter muscle (Sobotta-McMurrich); showing posterior portion that is detached from zygoma to give better access to operative field and later used to fill dead space.

and intra-alveolar are the chief cause of the condition.

DIAGNOSIS

Diagnosis is so obvious as to require but little attention. Only one joint is involved, except in those cases wherein atrophic or infectious arthritis is the predominating etiologic factor. In bilateral bony ankylosis, there is no motion; while, in unilateral involvement, regardless of the extent, there is slight motion when a voluntary attempt is made to open the jaw. The movement is largely of the gliding type, with the jaw swinging slightly to the affected side. Kazanjian[2] has shown the value of attempted protrusion of the mandible in differentiating intra-articular from extra-articular ankylosis. In the former, protrusion is slight or entirely lacking; in the latter, there is a quite normal forward thrust to the mandible. It has been my observation that a differential diagnosis of fibrous and of bony ankylosis can readily be made as follows: In the fibrous variety, even though it is firm enough to simulate bony change, forcible manipulation of the jaws beyond a certain point causes pain, which does not occur on extreme movement in bony ankylosis. In unilateral involvement, palpating both joints with the index finger of each hand fails to elicit any movement over the ankylosed area, while the unaffected side will move some on palpation.

Objectively, there is more atrophy of facial structures on the ankylosed side, and this atrophy gives rise to the characteristic facial asymmetry. (Fig. 1.) This atrophic change, combined with the activity of the depressor muscles of the mandible in their effort to overcome the fixation of the joint, results in a deformity, which has been classically described by Cryer. The extent of the deformity varies directly with the age of onset and the extent of the ankylosis. Skeletal development is not complete before the twenty-fifth year, and ankylosis occurring at any time prior to that age will cause deformity, whereas the more severe deformities occur in patients who contract the disease during childhood.

Roentgenographically, the lesion in bony ankylosis is readily demonstrated because the joint structures are entirely obliterated and are replaced by osseous tissue. In such cases, anterior-posterior

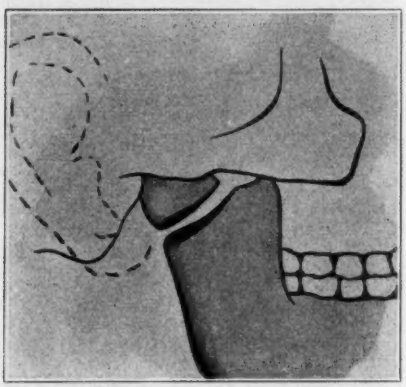

Fig. 5.—Diagrammatic drawing showing line of osteotomy when only condylar process is ankylosed. A liberal section of bone is removed, but no attempt is made to remove the condylar head from the glenoid fossa when there is bony fusion of the parts.

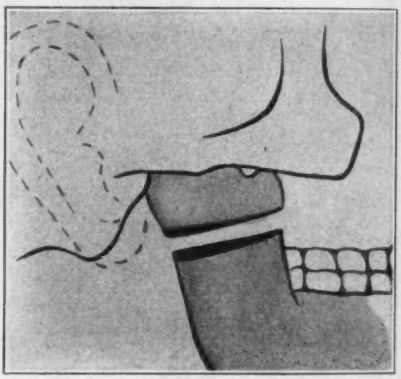

Fig. 6.—Diagrammatic drawing showing site of osteotomy when ankylosis involves coronoid as well as condylar process.

roentgenographic examination of the mandible may be of particular aid in determining the lateral extent of the pathologic process and thereby aid in formulating the operative procedure. Effort should be made to determine the extent of bony union with the skull in an anterior-posterior direction. It is not unusual to find the coronoid process as well as the condyle continuous with the bony structure of the skull; in which event, complete osteotomy of the ramus is necessary.

In fibrous ankylosis, little change may be seen in the joint. It consists of varying degrees of destructive or proliferative change of the head of the condyle with narrowing of the joint space.

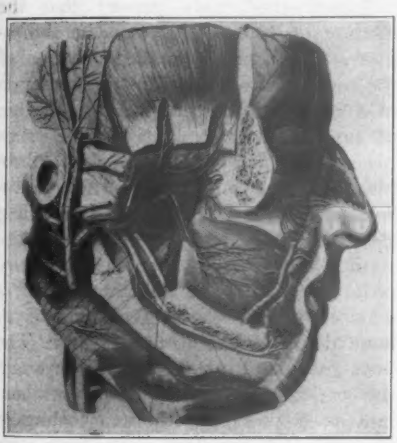

Fig. 7.—Internal maxillary artery (Sobotta-McMurrich); showing proximity to point at which ramus is divided.

TREATMENT

The only satisfactory treatment for true temporomandibular ankylosis is surgical. In nearly all cases seen, some attempt has been made to correct the condition by mechanical devices. These devices have no place in such cases. They do, however, have a limited place in the treatment of extra-articular ankylosis. They may be of some benefit in stretching scar bands that are not too thick, and, in these cases, a gradual constantly acting mild dilating force will assure better results than a positive, sudden, powerful force applied for brief periods of time. However, the great majority of the cicatrices require surgical correction. A rather serviceable type of exerciser is one originated by Darcissac. This apparatus is extremely simple, consisting of two metal trays passing between the occlusal surfaces of the upper and lower teeth. To the buccal side of each tray are soldered heavy steel wires, which pass out of the mouth and curve backward over the cheeks. These wires are so arranged and bent that a dilating force to the jaw is created when heavy elastic bands are hooked to the wires. The dilating force is constant. It can be varied for the particular case by increasing or decreasing the amount of elastic traction. It permits all the normal mandibular movements while the force is being applied. If kept in two sizes, child and adult, it is ready for immediate use in all cases. If the case is amenable to treatment by dilatation, improvement will be noted almost immediately after treatment is instituted. If improvement is not noted soon after treatment is started, the case probably calls for surgical correction.

Surgical correction of true ankylosis is referred to as mandibular arthroplasty. The operative field is prepared by shaving the hair above and behind the ear over an area of at least 2 inches. After proper skin preparation, the incision described by Blair and Ivy[3] is outlined with the point of a knife. (Fig. 2.) The incision begins anteriorly to the ear at its lower border and is carried upward to the upper border of the ear, from where it curves forward and then downward. The flap thus outlined allows for better retraction and exposure of the operative field when complete resection of the ramus is necessary.

Many operators prefer to use only a perpendicular incision, believing that the branches of the seventh nerve supplying the occipitofrontalis muscle are thus insured greater protection.

The incision outlined is carried through the skin only. The flap is dissected down and retained by suturing to the skin of the face. Incision is then made through the superficial fascia down to the zygoma and the deeper fascia covering the parotid gland and temporal muscle. In making this incision, care should be exercised to avoid the branches of the seventh nerve to the eyelid. Careful dissection will not only preserve the continuity of the branches of the seventh nerve, but will also preserve the temporal artery. (Fig. 3.) The transverse facial vein must be cut and tied. Immediately below the deep fascia is the capsular ligament surrounding the joint. The posterior border of the masseter muscle, where it is attached to the zygomatic arch, is also brought into view at this stage of the operative procedure and is detached if further exposure of the ramus is desired. (Fig. 4.) This detached portion of muscle can be utilized later to fill the dead space between the resected portions of bone.

With adequate exposure, the necessary resection is decided upon. If the bone proliferation is confined to the joint, resection of the neck of the condyle is all that is required. (Fig. 5.) True ankylosis, however, frequently obliterates the sigmoid fossa and involves the coronoid process. In such cases, resection of the entire ramus is necessary. (Fig. 6.) A section of bone one-half inch wide is removed from the ramus. This bone removal is greatly facilitated by the use of up-biting kerasin rongeurs. The use of this instrument is also an additional safety feature in that its blunt end prevents traumatic injury to the internal maxillary artery, the course of which coincides exactly with the course of bone cleavage. (Fig. 7.) The ankylosed condyle and coronoid process are left attached to the skull. No attempt is made to remove them, because of the thinness of the skull in the roof of the glenoid fossa and the thinness of the tympanic plate that separates the joint from the external auditory meatus. All bone spicules are removed. Bleeding is controlled and the wound closed in layers after the detached masseter muscle is interposed between the resected bone, to obliterate the dead space as nearly as possible.

Experiments[1] have proved that the efficacy of interposed tissue in arthroplasty is greatest when degeneration of the transplant occurs with the formation of a cavity. With this in mind, the use of fascia lata transplants hardly seems necessary in temporomandibular arthroplasty, as the interposed muscle seems to perform the same function of filling the dead space and acting as a hemostatic. The crux of the operative procedure seems to be the removal of a wide enough section of bone and of all bone débris before wound closure. The jaws are put at rest for several days and the patient is encouraged to use them only as is possible without a feeling of soreness. Too early use of the jaws after arthroplasty is apt to prolong the inflammatory reaction, which will predispose the joint to reankylosis.

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CHRONIC ENDEMIC DENTAL FLUOROSIS (MOTTLED ENAMEL)

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HISTORICAL NOTE

ENDEMIC hypoplasia of the permanent teeth of man, known variously as *denti di chiae, le darmous, schmelzflecke,* mottled enamel and, by the most recently accepted descriptive term, chronic endemic dental fluorosis, is a water-borne disease associated with the ingestion of toxic amounts of fluorides in the water used for cooking and drinking during the period of calcification of the affected teeth.

The condition is easily recognized by the typical lesions in the enamel of the affected teeth, especially on the labial surfaces of the upper anterior teeth.

In this lesion, the essential injury is caused by lack of development of the cementing substance between the enamel rods, wholly, or in part, in the outer one-fourth to one-third, more or less, of the enamel. In its typical manifestation, this portion of the entire enamel structure covering any surfaces of any teeth may be affected. There are varying degrees of severity in different individuals from different endemic areas.

According to the degree of completeness of the absence of the cementing substance, the enamel may present a dead "paper-white" opaque appearance or it may have a "mottled" appearance, in which there are white blotches and areas irregularly interspersed with areas of more or less normal enamel.

The affected areas have none of the translucency of normal enamel. Associciated with the various phases of this lesion, there is within the enamel structure, in many cases, a brown discoloration of all variety of shades. There is every degree conceivable in the mingling of color from light yellow to brown and even black. These variations in the occurrence and appearance of the lesion have until recently been a source of confusion for those who attempted to describe this peculiar type of hypoplasia.

During the progress of the investigation of the etiology of this endemic hypoplasia, a classification of its several variations has been gradually evolved. This classification recognizes six types:

Type 1. Questionable. Questionable translucency and snowflakes (white flecks 1 mm. in diameter or less are called snowflakes).

Type 2. Very mild. Small opaque paper-white areas scattered or streaked over the tooth surface, involving less than one-fourth of the labial surfaces; no brown stains.

Type 3. Mild. White opaque areas involving at least one-half of the labial surfaces; faint brown stains on the central incisors.

Type 4. Moderate. All tooth surfaces involved; minute pitting on labial surfaces; brown stains instead of opaque spots.

Type 5. Moderately severe. Greater depth of enamel involved; smoky white appearance of labial surfaces; brown stains deeper in color and deeper pitting.

Type 6. Severe. Affected pits deeper and fused together; stains from chocolate

brown to deep black; incisal edge involved in many cases.

The crown of the normal human tooth erupts as a smooth, glassy, translucent structure of pale creamy white; while those affected by endemic hypoplasia erupt as a dull, chalky, white structure. The various stains develop after eruption, but the markings are present at eruption and stain with age.

The lesion of endemic fluorosis attained its first prominence as a problem in dental science in the Rocky Mountain Region of North America. It was first brought to the notice of readers of dental literature from the State of Colorado by F. S. McKay and his associates, who reported it to the research laboratories of G. V. Black in Chicago during 1906, 1907 and 1908. It had been previously mentioned in the literature during 1902 by Dr. Eager, of the U. S. Marine Hospital Service, under the Italian name of *denti di chiae,* and was reported by him as being endemic in certain sections of Naples, Italy.

The research arising from these original reports is unique in dental science. In 1900, not one fact was known regarding the etiology or the mode of its occurrence. Nor was there any knowledge of the extent of its distribution throughout the world. It was later found to be limited to geographic areas the boundaries of which are sharply defined, and in those areas, regardless of how widely separated they might be, the lesion presented identical features. Almost without exception, the enamel developed within an endemic district will display the lesion. Conversely, enamel developed outside such a district will never, under any circumstances, become affected even though the individual should later become a resident of an endemic district.

Dr. Black, in 1906, recognized the lesion as a new problem in dental pathology, and it continued to occupy the minds and baffle the investigations of the researchers of the dental profession up until 1931. The effort to determine the etiology of this unusual lesion inspired many investigators in related fields.

The problem began to arouse international interest in 1916. Many countries began to report cases, and the investigators from the various countries advanced almost as many theories as to the etiology as there were investigators. It seems that for a time they vied with one another to establish the most difficult and least logical explanation of the condition. Scores of theories were presented at dental meetings and written into the dental literature of the period. The interest in the subject was so keen that one could almost allude to the years between 1916 and 1930 as the Mottled Enamel Period of the Dental Profession.

Thyroid disturbances, nutritional defects, heredity, constitutional deficiency, sunlight and sunburn were among the theories proposed as to the etiology.

Since, on ordinary water analyses, the drinking water from endemic areas showed no essential differences from water from non-endemic areas, the dental profession finally appealed to chemists to extend their standard water analyses to include a search for rare elements which might cause the lesion. Dentistry advised its histologists that an entirely new investigation of the process of enamel formation was indicated.

From Hunter's and Berdmore's first description of human tooth enamel down to the present, no more unique problem has ever confronted the dental profession.

PREVENTION AND TREATMENT

Early in 1930, Alex Bard, a practicing dentist of Tucson, Ariz., aroused the interest of Margaret Cammack Smith in the dental problem of mottled human enamel. Dr. Smith was at that time and still is the professor of nutrition and the nutrition chemist of the University of Arizona at Tucson.

In company with Dr. Bard, she visited St. David, Ariz. (one of the most affected districts known) in August of that year, and there for the first time she saw mottled enamel. Being a nutrition chemist, her first theory was that faulty nutrition might be an etiologic factor.

This theory was a fortunate one for the dental profession. Professor Smith returned to the laboratories of the university and, with her colleagues, Howard V. Smith and Edith Lantz, started the research project that ended less than a year later in establishing the presence of fluorides in water as the etiologic factor in the mottling of human enamel.

The causative factor discovered, then came the problem of prevention. Chemists, water works engineers, city, state and national research bureaus[1] shared the problems with the dental profession; until now, one seems justified in hoping that positive prevention is not far away.

Naturally, the best preventive is to change residence or to change the water supply. This, however, is not always possible. The use of rain water or distilled water for drinking and cooking purposes may also solve the problem for individual families; but what is needed is a measure that can be adopted on a large scale without prohibitive cost.[2]

Aluminum sulfate has been tried, with some success, for removing the fluorine from affected water, but has proved impractical for large scale purifying because of its cost. The activated carbon method[3] was classed as impractical for the same reason. Activated alumina[4] has also been used with varying success for this purpose. The lime soda process of eliminating fluorine promised well, but was also found to be quite expensive and needed to be under the supervision of a skilled chemist.[5]

Possibly the most practical measure for individual families is the use of the bone powder method,[6] which consists of passing the affected water through a filter of finely ground and specially prepared bone.

Fresh animal bones are obtained from meat-packing houses, and most of the fat and protein are removed by boiling in fluorine-free water. The bone is then finely ground and boiled in a dilute solution of sodium hydroxide until it assumes a snow-white chalky appearance. The excess alkali is then washed away in clean fluorine-free water, and finally neutralized with dilute hydrochloric acid. The bone material is then washed in distilled water, dried and graded for fineness. The use of bone powder beyond a certain fineness is impractical because of the difficulty of filtering water through it; but up to the point where water will pass through, fineness is an advantage.

The longer the affected water remains in contact with the bone in the process of filtering, the better the final result.

Under actual test, it was found that 30 gallons of water per hour can be purified by passing through 5 pounds of prepared bone powder in an aspirator bottle. This process, which lowers the fluorine content of water from 3.5 parts per million to 0.2 parts per million (which is well within the safety limits) is to be recommended for individual families.

It is also found that absorbed fluorine can be removed from used bone powder by the same process used in its initial preparation, and that bone twice renewed in this fashion was still found to have its original value.

Preventive measures, however, offer no relief to those who have already acquired the mottling. Several methods for removing the unsightly mottling of endemic fluorosis have been suggested in the literature from time to time, but possibly the most satisfactory method to date is the preparation of the affected teeth for the reception of porcelain jacket crowns. This is an expensive method and beyond the reach of many patients in endemic areas, but for patients who can afford it, it is offered as the best treatment for

anything beyond Type 4 dental fluorosis (Dean's classification).[7, 8]

For Types 1, 2 and 3 (and occasionally Type 4) of dental fluorosis, one of the following methods of treatment can be utilized:

First method[9]: Grinding and polishing of the affected surfaces with stones immersed in alkaline olive oil. The tooth surface and the stone must be moist with oil at all times.

Second method[10]: Hydrogen peroxide-ether method (5 parts of 100 per cent hydrogen peroxide to one part of pure ether). The technic for the second method is as follows:

1. A rubber dam isolates the teeth to be treated, the dam being packed with sponges to protect soft tissues. (The operator uses rubber gloves and shields and protects the patient's eyes and nose.)

2. A cotton roll the length of the affected teeth is saturated with the mixture and, with dental floss or a dam ligature, brought into contact with the teeth to be treated.

3. The solution is well shaken and the cotton roll saturated by pouring solution on it.

4. The cotton roll is heated with a small electric soldering iron which has the resistance controlled so that the iron will never reach cherry-red heat.

5. The treatment is continued for one half hour, the cotton roll being kept saturated and heated (1 cc. of ether and 5 cc. of hydrogen peroxide are sufficient for each sitting).

From five to twenty-five treatments are necessary.

With our knowledge concerning fluorosis gradually approaching completeness, there are still problems confronting us, and it would seem that a certain amount of work is still indicated on the fluorine contents of the diet.

It is now agreed that the continuous use of water for drinking or cooking purposes containing as little as 0.9 part fluorides per million will cause the damage associated with endemic dental fluorosis.[11] In concentrations of more than 1.5 parts per million, a Type 3 (or worse) fluorosis will develop in all of the permanent upper anterior teeth. In concentrations of more than twelve and one-half parts per million, the enamel of the deciduous teeth will be affected through the fetal circulation if the prospective mother drinks the water.[12]

It can be seen that water inside the safety margin might easily be brought into the dangerous water group by concentration of the fluorides in the cooking of foodstuffs.

NEW ENDEMIC AREAS REPORTED FROM WESTERN ASIA*

There are certain areas in the world where every native-born inhabitant has this peculiar defect of permanent teeth. In the preceding paragraphs of this report, we have offered a historical sketch and a discussion of prevention and treatment. It is the purpose of this section to report an endemic area not to our knowledge previously reported in the literature. While the current report deals only with our investigations of the water supply and the dental conditions of the present inhabitants of the ancient city of Palmyra, we believe that we have enough proof from water analyses and observations to declare the whole of the Arabian Peninsula, Asia Minor, the Near East and Mesopotamia endemic, in scattered sections at least, to this water-borne mottling of human teeth.

The present inhabitants of Palmyra are of mixed Arab stock, descended no doubt from the founders of the ancient city state of Palmyra, which reached its height under Queen Zenobia during the later Roman Period. The Grotto Spring and at least one of the currently used main springs were in use during Roman

*Three areas were positively identified in Iraq, two in Trans-Jordan, two in Syria, one in Bahrein Islands, two in Trucial Oman, Arabia, and one in Palestine.

times. The water was not considered fit by the Palmyrenes for drinking and cooking purposes, but was valued highly for medicinal bathing.

For a number of years, the dental authors of this report have been conducting a dental survey of the nomad Bedouin tribes of the Arabian Desert, and, during this time, thousands of cases of mottled enamel have come to notice.

A Bedouin, during his migration, however, partakes of many different waters from widely separated areas, and it is difficult to lay the blame on any particular source of water. Since a great number of these Bedouins spent the early years around Palmyra, we naturally turned to the city of Palmyra to determine the condition of his teeth. We discovered that every Palmyrene who was born in the city or who moved to the city during the first seven years of his life was afflicted. We therefore gathered generous specimens of all available drinking water in and around Palmyra, and it was found to contain from 2.0 to 2.5 parts of fluorine per million.

The Department of Pharmaceutical Chemistry of the American University of Beirut has assisted from time to time with reagents, but all the analyses mentioned in this report were made by one of us (A.J.P.) in the laboratory at Kirkuk.

The following test[13] has been used for estimation of the fluorine in the water from Palmyra.

ESTIMATE OF FLUORIDES IN WATER

The fluoride estimation is made after all other determinations have been concluded, to make possible the preparation of the synthetic water for the standards. In many cases, however, fairly close results are obtained, which may be useful for most practical purposes, by taking into consideration, in the preparation of the standards, the sulfate content only. In general, the latter simplification may be considered applicable to potable waters showing total solids of not more than about 500 parts per million, which are free from appreciable quantities of phosphate, and in which there is no reason for suspecting the presence of the ordinary constituents that are usually not found in potable waters, or the presence of ordinary constituents in unusual concentration. Sulfate solution of convenient concentration for use in the preparation of the standards is listed among the reagents. Similar stock solutions of known concentration of calcium chloride, magnesium chloride, sodium silicon dioxide, sodium chloride, ferric chloride, aluminum chloride, etc., may be kept on hand for convenience in the preparation of standards with water containing also ether constituents of the sample in addition to sulfate.

REAGENTS

(a) Zirconium oxychloride solution. Dissolve 0.5 gm. of zirconium oxychloride ($ZrOCl_2 \cdot 8H_2O$) in distilled water and make up to 100 ml.

(b) Alizarin sodium monosulfonate solution. Dissolve 0.1 gm. of alizarin sodium monosulfonate in distilled water and make up to 100 ml.

(c) Zirconium-alizarin reagent. To a chosen volume (50 ml.) of (a) add slowly, drop by drop, with stirring, an equal volume (50 ml.) of (b). If a turbidity remains after the final mixing, allow to stand for a few hours or overnight until it clears. Finally, dilute the mixed solutions with double their volume (200 ml.) of distilled water.

Keep solutions (b) and (c) in a cool dark closet.

This reagent, applied in accordance with the following procedure, is most sensitive to fluoride when freshly prepared. Hence, in dealing with waters containing only 1 part per million of fluoride, it should be used before it is more than a few days old.

(d) Standard sodium fluoride solution. Dissolve 0.2210 gm. of sodium fluoride (NaF) in distilled water and make up to 100 ml. From this stock solution, prepare the standard solution by diluting 5 ml. to 100 ml. with distilled water (1 ml. is equivalent to 0.05 mg. of fluorine).

(e) 5/N hydrochloric acid.

(f) Sodium sulfate solution. Dissolve 14.8 gm. of a fluoride-free anhydrous sodium sulfate (Na_2SO_4) in distilled water and make up to 1 liter (1 ml. is equivalent to 10 mg. of sulfate [SO_4]).

PROCEDURE

To 50 ml. of the sample of water, or a smaller quantity diluted to 50 ml. with distilled water, and to each of 50 ml. of standards containing known amounts of fluoride in water of similar composition as the specimen used (prepared on the basis of the analysis), add 5 ml. of 5/N hydrochloric acid and 1 ml. of the zirconium-alizarin reagent, mixing well after each addition. Allow to stand at room temperature overnight (about eighteen hours) and then compare the color of the specimen, in standard Nessler tubes, with the colors of the fluoride standards.

The fluoride standards are prepared so that neighboring tubes in the series vary from each other by 0.01 mg. of fluorine. In accordance with the concentration of fluoride in the specimen under examination and on the sensitivity of the available zirconium-alizarin reagent, the fluorine quantities of suitable series may be 0, 0.01, 0.02, 0.03, 0.04, 0.05, 0.06 and 0.07 mg., respectively; or 0, 0.06, 0.07, 0.08, 0.09, 0.10, 0.11 and 0.12 mg., respectively. These are obtained by measuring out, from a finely graduated 1 ml. pipet, the corresponding volumes of the standard sodium fluoride solution and diluting with synthetic water of similar composition as the sample to 50 ml., or diluting with a volume of the synthetic water equal to that of the specimen used and distilled water to 50 ml.

Erlenmeyer flasks of about 125 ml. are convenient for the preliminary mixing. The solutions should, however, be transferred to the Nessler tubes as soon as practicable. The solutions should also be mixed well immediately before the colorimetric comparisons, since there appears a tendency for the coloring matter to precipitate on standing. The calculation to parts per million is made as usual and the results are expressed in terms of fluorine.

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A TECHNIC FOR GENERAL ANESTHESIA IN SURGERY OF THE MOUTH

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IMPROVEMENT in surgical procedure always has been associated with a corresponding improvement in anesthesia. Before the era of pain prevention, surgery was rudimentary, being limited to emergency work only, and the technic was trying indeed. Hayden[1] describes one of these early scenes:

With a meek, imploring look and the air of a startled fawn, as her modest gaze meets the bold eyes fixed upon her, she is brought into the amphitheatre crowded with men, anxious to see the shedding of her blood, and laid upon the table. With a knowledge and merciful regard as to the intensity of the agony which she is to suffer, opiates and stimulants have been freely given her which, perhaps at this last stage, are again repeated. She is cheered by kind words and the information that it will soon be over and she freed forever from what now afflicts her; she is enjoined to be calm and to keep quiet and still; and with assistance at hand to hold her struggling form, the operation is commenced.

But of what avail are all her attempts at fortitude! At the first clear, crisp cut of the scalpel, agonizing screams burst from her, and with convulsive efforts she endeavors to leap from the table; but force is nigh. Strong men throw themselves upon her and pinion her limbs. Shrieks upon shrieks make their horrible way into the stillness of the room, until the heart of the boldest sinks into his bosom like a lump of lead.

At length it is finished, and, prostrate with pain, weak from her exertions and bruised by the violence used, she is borne from the amphitheatre to her bed in the wards, to recover from the shock by slow degrees.

After anesthesia was introduced, surgical technic improved and, with each forward stride in the latter, the anesthetist strangely enough moved ahead also. Study of this matter reveals that improved anesthetic methods permit better surgical work because of the greater

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relaxation of and less danger to the patient. Therefore, the deduction that modern surgery, with its unparalleled low mortality and unbelievable excellence, owes much of its preeminence to better anesthesia seems justifiable.

The simile holds true in mouth surgery. Many of you, I know, recall with me the era of so-called gas extractions. The mouth was kept open with a prop of questionable efficiency, a nasal inhaler was applied, the mouth was covered and nitrous oxide under pressure was turned on. The patient's color soon changed from the normal to cyanosis, accompanied by hyperpnea and rigidity, the degree depending on the courage and experience of the anesthetist. At about this time, the nitrous oxide was diluted with air or the inhaler was removed temporarily, the extraction being done with haste in the interval, since the most favorable operating time was recognized as immediately after anesthesia, or, if you wish, asphyxia, had been induced. Furthermore, the color and rigidity of the patient were not pleasant to look upon or reassuring, so some of the tasks were a little hurried. This haste did not simplify or improve the work and, all too frequently, the end-result left much to be desired.

Compare this picture with that of today, when such equipment, training and technic are available as permit us to assure patients that, if they wish, it is possible for them to escape the reality of witnessing or being present consciously at the operation which they contemplate, doubtless with great uneasiness and alarm.

Many persons who have enjoyed the benefits of general anesthesia say apologetically, "I know I'm being foolish and cowardly to want to go to sleep for this, but I just don't want to know anything about it." The thought of cowardliness may have been prompted innocently by some devotee of local anesthesia, but such attempts to discredit general anesthesia are unjust and provincial. The comprehensive view of practice today necessarily emphasizes the fact that there are branches of the work which have not been mastered and yet we cannot deny their virtues. In the absence of definite

Fig. 1.—Submaxillary edema (Ludwig's) closing airway at A.

Fig. 2.—Postpharyngeal edema causing near occlusion of palatal tissues with base of tongue at A.

contra-indications, general anesthesia should be provided for those who wish it.

All of us have seen patients turn pale and sometimes lose consciousness during or after injection of a local anesthetic, and the loss of consciousness is promptly blamed on the injection, whereas the cause is simple syncope induced by fear and pain, neither of which is present if the patient is asleep. Just as general surgery employs several methods, surgery of the mouth has infiltration, block and general anesthesia at its command, and fortunately too, for an honest judgment often dictates the use of one method in preference to another.

Fig. 3.—Normal airway.

Fig. 4.—Properly placed pack acting as barricade, but not displacing tongue.

Nitrous oxide needs no introduction to dentistry. So much has been said and written about it since its presentation by a member of our profession nearly 100 years ago that the agent is well known to all; but, in spite of this, an inexplicable estrangement exists between it and the majority of the dental profession. The applicability of nitrous oxide-oxygen anesthesia to oral surgery is very wide because of its special endowments of safety, ease of application, rapid action and reduction of postoperative distress. Nor can any thinking person deny that dental work for children, multiple extraction and necessary surgical work in the presence of edema and infection are better managed through its use.

McCarthy[2] reports administration of a total of 10,602 anesthesias in dental cases by students without a death from the anesthesia. Naturally, however, there are factors to be considered before electing to use it: first, the patient; second, the task to be performed, and, third, the experience of the anesthetist and of the operator.

Classifying the patient is very informative. Usually, women are better patients than men, and self-possessed, calm persons are more easily managed than neurotic, highly nervous or badly frightened ones. Facial development also tells us something. Certainly, we anticipate more resistance in the presence of gross, well-developed facial muscles because of a reduced working space and the absence of relaxation. Moderate obesity need cause no worry, for the moderately obese patient is often in excellent health.

With the very obese, there is a different story because breathing is made difficult for them when the mouth is wide open or mouth packs are used. The emotional and fighting types also require more than ordinary care.

Most of our patients are ambulatory and look healthy. If they feel bad, they say so. Sick persons usually give a history of illness. Thus, without extensive physical examinations, we can obtain valuable information by discussing briefly the state, or supposed state, of health of the patient. When such discussion suggests physical disability, more data should be obtained.

Fig. 5.—Large carelessly placed pack pushing tongue backward and obstructing oropharynx.

Premedication is of the greatest value for insuring smoother anesthesia. With its aid, the metabolic rate of the child is decreased, the neurasthenic is more calm and the athlete is less active. In any but the simple cases, patients should be examined and suitable premedication be provided and an appointment should be made for a later date. This precaution will decrease the number of cases that make our work harder than it need be.

THE TASK AT HAND

Obviously, some parts of our work are more difficult than others, and nothing should be done to complicate them further. When the mouth is small or when disease of the temporomandibular joint prevents normal opening, or if the extraction of buried roots, deeply impacted teeth or many ankylosed teeth is the problem, one must not expect general anesthesia to simplify the task.

If external incision and drainage are needed in the neck or face, steps must be taken to prevent products of suppuration from being aspirated. It is worth repeating that massive facial swelling is often associated with pterygomaxillary and parapharyngeal edema, which is also localized, and if the facial condition only is known, disaster may follow rupture of the intra-oral area under general anesthesia. If hazards exist, more than ordinary caution must be exercised to insure safety.

Fig. 6.—Small pack slipping downward to depress epiglottis.

EXPERIENCE OF ANESTHETIST AND OPERATOR

Experience is invaluable for both the

anesthetist and the operator. If both are capable, minor accidents and errors are few, but if both are untrained, the possibility of trouble is great. The adage "Nothing attempted, nothing gained," while doubtless true, should be applied with caution to oral operations under nitrous oxide-oxygen anesthesia. In learning to work with this anesthetic, normal patients with simple conditions should be chosen until practice has brought assurance and knowledge as to how to meet the various problems which arise. Before electing to use nitrous oxide, one should consider the patient and the operation to be performed and one's ability to perform it.

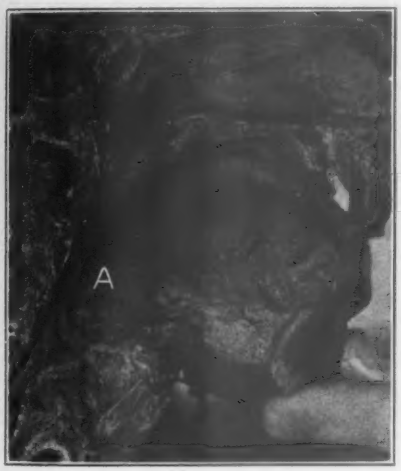

Fig. 7.—Depression of mandible decreasing airway at A.

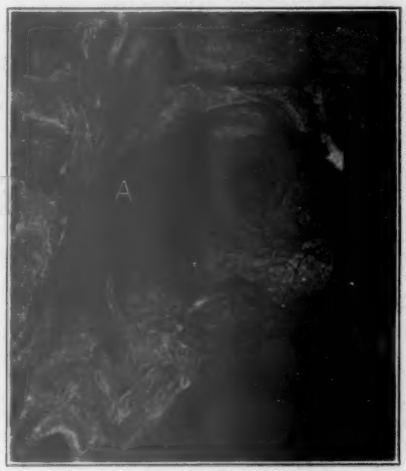

Fig. 8.—Elevation of mandible to restore normal opening at A.

PUTTING THE PATIENT TO SLEEP

During anesthesia, the patient should be comfortable, in a semirecumbent position to insure support with relaxation. A means of restraint must be provided. The dental chair meets these requirements well. Breathing is easier in this position than in recumbency, and a position favorable to emesis is immediately available by simply returning the chair to the upright.

Reiterating the need for adequate provision to keep the mouth open seems unnecessary, and yet at least half of the trouble encountered in the extraction of teeth under general anesthesia is due to a lack of sufficient room in which to work. At the time of insertion of the prop, the patient seldom opens the mouth wide enough, and must be admonished to open wider. No one style of prop will meet the multiplicity of conditions found in different mouths and the prop chosen must satisfy the individual requirements, which means that it will stay where placed. Since a mouth pack will be used and, at least in early anesthesia, the tongue will interfere, ample space must be provided. It is well to remember that there may be too little room before anesthesia, but there will be still less afterward. Only occasionally in adults should an attempt be made to open the mouth and insert a prop after anesthesia has been established. Regardless of the pressure used, in the absence of relaxation, opening the mouth sufficiently to assure good vision for the operator is seldom successful, and a

power gag may displace teeth and lacerate soft tissues.

Perhaps the most frequent complaint about previous anesthesia is a sense of smothering during induction. If, after the prop is placed, a close-fitting nasal inhaler, with no pressure in the tube leading to it, is quickly fitted over the nose, and the mouth is covered simultaneously, the sensation is disconcerting and alarming. However, if a gentle breeze of gas flows from the nosepiece as it goes into position, if the mouth is not covered until consciousness is waning and breathing instructions and words of assurance are given, little discomfort will be experienced.

Restraint as needed is now applied, and, while adequate to prevent troublesome movement, it must not bruise or abrade the skin surfaces or restrict free excursion of the chest walls and diaphragm.

When a workable level of anesthesia is reached, as evidenced by fixation of the eyeballs and rhythmic respiration, the mouth is uncovered and a pack is inserted against the velum behind the mouth prop. (Figs. 1 and 4.) If the pack obstructs the airway (Figs. 2 and 3) or permits mouthbreathing, it must be readjusted and, if necessary, another added. Hemorrhage is controlled by an aspirator and gauze sponges, to prevent saturation of the barricade pack. When the surgical procedure is finished on one side, the prop is moved and adjusted to exert pressure with the gauze on the bleeding surface.

Sponges require constant supervision in order to be changed when necessary and to block any leaks around the pack. Raising the pressure of the gases is futile if the mouth is not packed properly.

Fig. 9.—Oral airway.

Fig. 10.—Nasopharyngeal airway.

When the operation has been completed, the packs are left until the reflexes are returning. Too early removal will let mouth fluids and blood run into the throat. Later removal will cause gagging.

OBSTRUCTED BREATHING

Forward movement of the patient or downward pressure on the mandible may decrease the airway and invite progressive asphyxia (Fig. 7). Elevation of the mandible (Fig. 8) corrects this. In the event that the mandible is short or there

is labored breathing in an incumbent position, mechanical aid is of great value. The common types are: oral, nasopharyngeal and naso-endotracheal (Figs. 9, 10 and 11). If it is difficult to place the last, the epiglottis can be elevated with the laryngoscope and the prop be inserted under direct vision (Fig. 13).

CYANOSIS AND ANOXEMIA

The patient is cyanosed when only part of the hemoglobin is saturated with oxygen, but cyanosis does not mean an insufficiency of oxygen for body needs.

Fig. 11.—Naso-endotracheal airway.

Fig. 12.—Laryngoscope blade used to elevate epiglottis to permit passage of catheter under direct vision.

Anoxemia, on the other hand, indicates an insufficiency of oxygen for metabolic requirements from lowering of the partial pressure of oxygen in the blood. (Haldane.)[3] A full-blooded person has an excess of hemoglobin and will become cyanotic after breathing but little nitrous oxide, while one with a reduced number of red blood cells, as in anemia, will exhibit many signs of oxygen want without becoming cyanotic. Furthermore, cyanosis is not injurious when not productive of anoxemia, which in itself is dangerous and, if prolonged, will result in destruction of the nerve cells. How, then, are we to differentiate these two conditions, tolerating one when necessary and aborting the other at its onset?

Generally speaking, nitrous oxide anesthesia causes cyanosis in plethoric and resistant types before a workable level of anesthesia is attained. If this level is deep and permits but a low percentage of oxygen in the mixture, the tissue supply of oxygen will soon be consumed, and if the level of anesthesia is continued without the addition of oxygen as saturation approaches, a real oxygen want will develop. A short period of this is not harmful, but if it is prolonged, permanent damage results. (Clement.[4])

Therefore, as the anesthesia progresses, more oxygen will be tolerated, and additions are made to the mixture as often as is feasible without disturbing the level. One is frequently amazed at the high percentage of oxygen in the mixture toward the end of an anesthesia in comparison to the amount used in the beginning. Cautious attempts to add oxygen will not affect the anesthesia, but will prevent the development of a

dangerously deep and possible injurious anesthetic state. Since a safe plane of anesthesia for even prolonged cases does exist, we must learn its borders thoroughly.

TOO LIGHT ANESTHESIA

If far too many dental operations were not begun before a state of anesthesia exists, so many patients would not say that their fear of anesthesia is based in part on the fact that they felt pain before, or wakened in the middle of the operation or were dimly aware of what was happening, but were helpless to move or help themselves. Equally unnecessary is the other extreme, where respirations cease and resuscitation is required.

CONTROL OF ANESTHESIA

The conduct of anesthesia may be likened to instrument flying, in which, by attentive observation of known guides, the pilot is able to feel his way from place to place. The anesthetist's beacons are the much mentioned and too little used signs of anesthesia, and a brief reference here seems permissible to help us to recall them. They are: respiratory, color, muscular, eye and pulse signs. Of interest, but confusing, are the eye changes, made up of the lid, globe and pupillary signs; the changes evidenced by the two nervous systems, sympathetic and central, and two sets of muscles, the dilators and sphincters, and two general conditions, stimulation and paralysis. (Flagg.[1])

The pupil dilates when the sympathetic nervous system is stimulated, as during induction. It contracts when the central nervous system is stimulated, as by light, admitted by raising the upper lid.

When the sympathetic nervous system is paralyzed, the pupil contracts because the sphincters are allowed to contract; and when the central nervous system is paralyzed, the pupil dilates because the sphincters relax. Interpreted broadly, dilation of the pupil during early or light anesthesia is not alarming, but occurring in the deep plane, it is critical.

Generally speaking, a simple application of these guides is sufficient in office practice, but their fundamentals must be understood and applied.

RESPIRATION

Doubt still exists as to when to add oxygen to the mixture during induction. After several breaths of nitrous oxide, the rate of breathing increases, because oxygen is needed, and inspiration is accelerated to get it. Therefore, there need be no uncertainty as to when to add oxygen in induction. Until the respiratory rate increases, none is necessary, and then only enough to reduce the rate slightly. Likewise, in very deep anesthesia, shallow or irregular respiration means depression of the respiratory center and more oxygen is needed. If the narcosis is long, rebreathing is advisable, since conservation of carbon dioxide increases the respiration rate and the anesthetic material is conserved.

The beginner must train his ear to listen to breathing. A dislodged mouth prop or pack or a depressed mandible can clog the airway and institute asphyxia. During the stage of maintenance, the rate of respiration is slightly higher than normal and respiration is of even volume. Any variation from this must be investigated. Noisy aspirators, conversation and other diversions must not be permitted to detract attention from the patient's breath sounds.

EYE AND MUSCLE SIGNS

An active lid reflex and rolling eyeball denote light anesthesia, while a sluggish lid and fixed eyeball are almost infallible signs of the working stage. Likewise, dilation of the pupil is expected amid excitement, but if associated later with irregular or suspended breathing and

ashen grayness, it means collapse of the central nervous system.

PULSE

A strong, rapid, full pulse is present in a healthy person during induction, but if, as anesthesia progresses, the pulse becomes weak and irregular, good judgment demands withdrawal of the anesthetic and the administration of oxygen until the volume and rate are definitely improved.

MUSCLE RELAXATION

Nitrous oxide anesthesia, as used in the average dental operation, causes a questionable amount of relaxation, particularly before saturation takes place; but work should not be started during the excitement stage as the patient may struggle or swing his arms and interfere with the operation, and be conscious of what is happening. Fear that the patient may go too deeply under the anesthetic is usually responsible for beginning the operation prematurely, a tendency which can be overcome by learning to recognize without hesitancy a workable plane. The distress which a patient experiences from attempted surgical measures in partial anesthesia is inexcusable and preventable. The individual who is resistant to the anesthetic agent requires more time to be anesthetized. Clement[4] advises induction with a minimum amount of oxygen till signs of oxygen want are apparent, the percentage thereupon being slightly increased temporarily and the process repeated until the tissue oxygen is sufficiently depleted. He states that as the effect of changing this mixture will not be apparent for from three to ten seconds, an average of seven, in repeated efforts at saturation care must be taken to prevent the addition of too much oxygen or the aim will be defeated.

SUMMARY

To use nitrous oxide-oxygen successfully requires an understanding of the principles of inhalation anesthesia, and this is not a formidable task. Such knowledge explains the changes in appearance and action of the patient as they occur and suggests the procedure to be followed. It makes possible intelligent control and prevents panic and dismay, and most accidents. False reports, fear, doubt as to one's ability to learn its use and unfamiliarity need not be stumbling blocks in the inclusion of this anesthetic in office practice. The rapidity with which the majority learn to manage it after brief periods of training is gratifying and no mystery should surround it. Most failures occur when there is little or no preparation to its introduction and, as in many other lines of endeavor, the beginner must creep before he walks.

Just as examination and diagnosis precede intelligent therapeutic endeavor, they dictate the course of anesthesia. Disregard of important physical and structural contra-indications leads to complications. Such handicaps are not insurmountable, but they do require special precautions such as premedication or modification of technic or other additional aids. Nitrous oxide-oxygen anesthesia can be adapted to the patient's eccentricities however varied, provided preoperative investigation has been painstaking enough to reveal them.

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A METHOD OF SECURING CORRECT IMPRESSIONS

By WALTER H. WRIGHT, D.D.S., Ph.D., Pittsburgh, Pa.

OBJECTIVES are necessary when making impressions and the three most important ones, in the order of their attainment, are stability, retention and comfort. Each, as will be shown, is obtained through definite procedures, which are carried out in sequence, thus dividing impression making into three separate steps, as follows: 1. An impression must be adapted to the denture supporting tissues so that it will remain stable, so far as possible, when subjected to vertical and lateral pressures. 2. The entire periphery of an impression must be adapted to the mucosal flexure or fold, to secure retention by excluding the air. 3. The patient must be comfortable when the finished impression is inserted and tested under pressures applied in vertical and lateral directions. The attainment of these objectives is not dependent entirely on the dentist's ability, since the renitent properties of the tissues may not be conducive to either retention or stability; for instance, when the supporting tissues are very hard or very soft.

In general, it is easier to adapt the supporting surfaces of an impression than to conform its peripheral margins to them. So-called "muscle-trimmed" impressions frequently lead to overextension of dentures; whereas dentures made from impressions not muscle trimmed are usually underextended (too short).

From the University of Pittsburgh School of Dentistry.

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Impression making is simplified by dividing the impression technic into three distinct steps, as recommended in this paper: (1) acquiring stability through proper adaptation to the supporting tissues; (2) securing retention through accurate peripheral adaptation (muscle trimming), and (3) testing for comfort.

Pressure, when mentioned, refers to the surface application of a force the magnitude of which does not exceed the physiologic tolerance of the supporting tissues. So-called tight-fitting impressions which constrict the soft tissues and interfere with normal function are dangerous to oral health and frequently lead to loose-fitting dentures. While relatively heavy pressure may be required in adapting the seating surface, only slight pressure can be used in adapting the peripheral margins.

It is not the aim of muscle trimming to secure a tight pressure contact with the mucosal flexure. Instead, the mucosal fold should lie against the margins of the impression unstrained and in a physiologic manner, neither dislodging the impression nor permitting air to enter. If the impression is overextended, the finished denture will impinge upon the peripheral tissues during function, and this interference will become progressively worse as the denture settles into the tissues. Soreness of the tissues and intermittent adjustment of the dentures may result.

Fortunately, the flexibility of the mucosal fold is such that it will tolerate variable degrees of overtension, in accordance, of course, with the location of

the region. For example, the peripheral zone of toleration of the mucosal flexure (Fig. 1) may vary from approximately 10 mm. in the postpalatal region to 1 mm. at the labial frenum. I have seen a mouth in which the toleration zone of the maxillary right buccal mucosal fold was so narrow that retention could be obtained, or lost, by simply adding, or removing, a thin layer of paraffin wax. Likewise, I have been able to provide perfect retention in a lower denture, which loosened every time the patient smiled, simply by relieving the left labiobuccal notch (LB, Fig. 2) of the denture to a depth of approximately 1 mm. The retention of that denture could be destroyed at will by adding the thinnest layer of wax or compound to that margin.

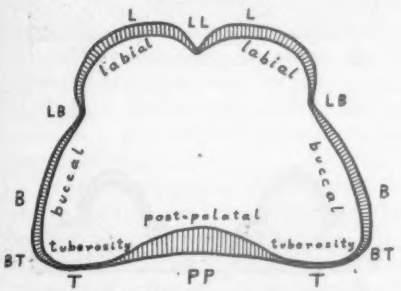

Fig. 1.—Maxillary impressiogram.

The peripheral zone of toleration is shown on the impressiograms (Figs. 1 and 2), which represent the outlines of maxillary and mandibular impressions that have been flattened out. The inner line represents the smallest size to which the peripheral margin may be reduced without losing retention, while the outer line represents the largest size to which it may be extended without causing displacement of the impression. Where the inner and outer lines approach or nearly touch each other, for example at LL or LB, the zone of toleration is narrow and requires accurate peripheral adaptation of the impression. These impressiograms do not show all of the narrow zones of toleration, nor the maximum variations which may be seen in unusual mouths.

EQUIPMENT AND MATERIALS

The following equipment and materials are recommended:

1. An electric water heater that will maintain a constant temperature of approximately 140° F.
2. A hand-operated alcohol blowtorch to flame the compound.
3. Two kinds of impression trays: rigid aluminum trays with handles attached and flexible aluminum trays with detachable handles and of assorted sizes.
4. A white enameled pan or bowl for cold water.
5. A water syringe similar to a chip blower.
6. A sharp pocket knife, or compound

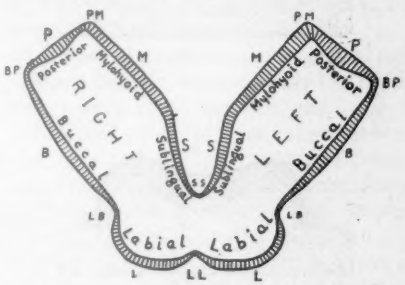

Fig. 2.—Mandibular impressiogram.

knife, and a small carborundum sharpening stone.

7. An indelible pencil.
8. Absorbent linen or cotton towels for drying the impression.
9. White and red colored impression compounds which are workable at 130° F., and 140° F., respectively; likewise tracing stick compounds.
10. Zinc oxide-eugenol paste, plaster of Paris or wax, to be used when a supplementary corrective lining is desired.

IMPRESSION PROCEDURES

A preliminary and a final impression of each jaw are essential to rapid and accurate work. The technical procedures in

making, first, the maxillary and, second, the mandibular preliminary impression follow.

Maxillary Preliminary Impression.—A selected tray is tried in the mouth and, if necessary, is bent until it approximately fits the maxillary ridge and palate. The labial, buccal and palatal margins of the tray may be trimmed until they do not impinge upon the attachment of the mucosal flexure or, as some prefer, the overextended tray may be used while the compound is first being adapted, after which the tray may be removed so that the compound impression can be trimmed to the correct height with a knife.

Softened white compound is placed on the tray and molded by the fingers to the approximate shape of the ridge. The compound next to the tray is chilled by lowering the tray only into cold water. The seating surface of the compound is flamed with the alcohol torch and then tempered in water of 130° F., and the compound is carried to the mouth, firmly seated and adapted by massaging the cheeks and lip, thus reducing the amount of overextension. The impression is removed, chilled in cold water and dried before the next step, which involves the use of a peripherogram.

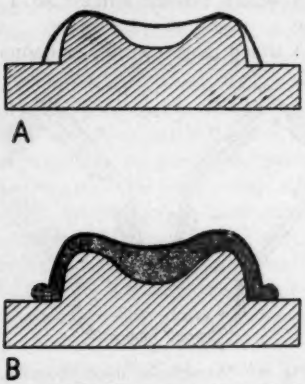

Fig. 3.—A, maxillary tray adapted. B, compound and tray adapted.

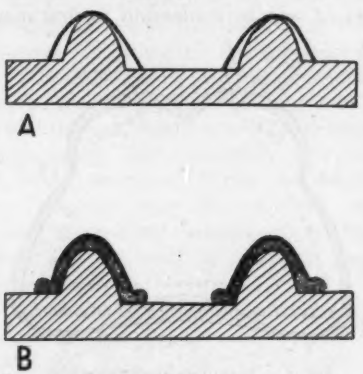

Fig. 4.—A, mandibular tray adapted. B, compound and tray adapted.

A peripherogram is an indelible tracing made in sections around the base of either the upper or the lower ridge at the line where the flexible mucosal fold is attached to the ridge. This line separates the tissues which eventually will support the denture from those which create the peripheral valve seal, marking the beginning of the zone of toleration, or the line at which muscle trimming begins. The line of the peripherogram coincides closely, but not exactly, with the inner line of the impressiograms in Figures 1 and 2. When the peripherogram is used, the final impression can be prepared without overextension, thus permitting the seating surface to be properly adapted and tested for stability.

The peripherogram is made as follows: The lip is raised to expose the upper anterior ridge and a line is drawn from cuspid to cuspid region, with a copying pencil, along the attachment of the labiomucosal flexure. The saliva dissolves the pencil line. While the lip is still elevated to avoid smearing the indelible line, the previously dried preliminary impression is inserted. When removed from the mouth, the white compound impression will show the indelible line around the labial margin. That part of the labial margin extending higher than the peripherogram is cut off, and thus a flat surface

approximately 3 mm. wide is formed on top of that margin. This flat surface provides a broad flange on the study cast. The sharp edges are smoothed to prevent injury and the impression is tested in the mouth. Likewise, the buccal margins and, in turn, the postpalatal margin are similarly marked and trimmed to the line of the peripherogram. Finally, the preliminary impression is inserted, examined and further trimmed, if, in any area, the impression impinges upon the attachment of the mucosal flexure.

Mandibular Preliminary Impression.—In a similar manner, the lower impression tray is selected and trimmed, if necessary, until the labial, buccal and lingual borders do not impinge upon the mucosal flexure. It is then filled with white compound, which is conformed, heated, tempered, inserted, carefully oriented, pressed against the mandibular ridge and, finally, adapted by massaging the cheeks and lip upward, and by having the patient raise the tongue toward the palate. The impression is then removed, chilled in cold water and dried.

As previously explained, the labial and the buccal margins are separately marked by the use of the peripherogram and trimmed with a knife, whereupon the impression is returned to the mouth, examined and finally trimmed again, if necessary, to avoid impingement upon the labial and buccal mucosal flexure. Since it is difficult to make a peripherogram of the lingual surface of the mandibular ridge, the lingual borders of the impression are trimmed with a knife at a level continuous with the mylohyoid ridge and the lingual frenum.

Occasionally, it may be necessary to extend a lower impression of a greatly resorbed mandibular ridge onto the reflected mucosa of the cheeks and lip to obtain denture support which the diminutive ridge cannot provide. Such atrophic ridges require special procedures, beyond the scope of this paper.

Study Casts.—Both preliminary impressions are dried and filled with plaster of Paris or artificial stone. When set, the casts are recovered.

Maxillary Final Impression.—Either of two methods may be followed in preparing for the final impressions: (1) vulcanite trays can be made on the preliminary study casts or (2) metal trays and compound can be adapted to the study cast. The latter, by far the more common, will be described. A thin aluminum tray with detachable handle is selected, conformed and trimmed, if necessary, so that it rests on the crest of the ridge of the study cast, while, if possible, the labial and buccal edges of the tray touch the flange of the cast as shown in Figure 3 A. Softened red compound is sealed to and spread over the tray and conformed, by the fingers, to the approximate shape of the study cast. The compound in the tray is flamed, tempered in water (140° F.), precisely oriented and pressed onto the previously moistened study cast. After being adapted to the cast, the layer of compound should be 5 mm. thick between the tray and the cast (Fig. 3 B), thus providing sufficient depth of compound for subsequent operations. The impression is removed from the study cast and chilled. The excess compound is cut away and the margins are reduced in thickness to approximately 3 mm., after which they are smoothed and cleansed.

The impression is now prepared for the first oral step; namely, surface adaptation to the ridge and palate. The surface of the compound is lightly flamed with the alcohol torch, after which it is tempered in water (140° F.) either by submersion or by flooding with hot water from the syringe. Thus prepared, the impression is inserted and seated against the ridge and palate, by firm finger pressure in the center of the tray. The compound is allowed to harden without chilling in the mouth, after which it is removed, chilled in cold water and examined. The formerly glossy surface of the compound should be imprinted with the fine mark-

ings of the mucous membrane throughout the impression. Lacking these, the impression is again heated and readapted to the supporting surface. When the imprint on the compound shows the mucosal markings throughout, the impression is chilled, reinserted and tested for stability, as explained earlier in this paper.

If the impression tips or rocks when vertical pressure is alternately applied to opposite cuspid-molar regions, or if it shifts from side to side when lateral pressure is alternately applied to the right and left buccal surfaces, the impression must be further stabilized, provided the renitent properties of the mucous membrane are favorable.

Stabilization of the impression may require: (1) further softening and more forcible seating of the impression, (2) relief of impression areas which cover hard tissues, (3) the addition of more compound in soft tissue areas to cause displacement or (4) surgical removal of flabby tissues, which impair stability. When the impression has been stabilized, as far as possible, it will generally possess a fair degree of retention before it has been muscle trimmed.

All that remains to be done now is to muscle trim or, figuratively, to put the lid on the impression, thus preventing ingress of air when the impression (and later the denture) is subjected to tilting pressures. Muscle trimming is done, as usual, by heating and tempering small sections of the periphery, after which the impression is inserted and held firmly in place while that area is adapted by the operator, either with or without the patient's aid. Tracing-stick compound may be added to any point of the periphery which is too short. Lastly, a thin layer of compound is traced across the entire postpalatal and posttuberosity margins to form the postpalatal seal, or postdam. The compound is flamed, tempered, inserted and forcibly seated. It is then held firmly in position while the index finger is brushed with light pressure across the escaping compound at the postpalatal margin. This assures a snug fit along that margin. After the compound has hardened, the impression is removed, chilled in water and returned to the mouth for testing. It should not be possible to displace it by any normal function, such as smiling, laughing, talking, coughing, swallowing, lip and cheek action and jaw movements.

Referring to the maxillary impressiogram in Figure 1, I call particular attention to the posttuberosity areas (T and T), since these have a marked influence on the retention of an upper impression. Unlike the anterior areas LB and LL, which must be carefully relieved by muscle trimming to avoid impingement upon the mucosal attachments, the posttuberosity margins must be adapted by pressure to fill the palatomaxillary grooves or notches. These grooves are formed by the posterior surface of the tuberosity of the maxilla and the triangular process, or tuberosity of the palatine bone. In many mouths, a well-defined and rounded groove will be found in both posttuberosity regions, and these form well defined posttuberosity margins on many maxillary impressions.

After the compound impression has been made, many operators prefer to supplement it with a corrective lining of plaster of Paris, zinc oxide-eugenol paste or wax. In general, these correctives are used to increase the stability and retention of impressions which have not been perfected to the extent described in this paper. When plaster or paste is used, an escape vent should be provided by enlarging the notch occupied by the labial frenum or by drilling a hole through the impression and tray distally to the incisive tubercle. Such vents permit the escape of excess material which would prevent correct seating of the impression. When wax is to be used, the compound impression should be less tightly adapted to provide space for this thicker material.

Mandibular Final Impression.—A thin aluminum tray with detachable handle is selected and conformed, as previously described, to the mandibular study cast. The tray should rest on the crest of the ridge of the study cast and its borders should extend, if possible, to the flanges of the cast. (Fig. 4 A.) When prepared in this manner, the tray cannot interfere with the mucosal flexure during muscle trimming.

The tray is filled with red compound, which is contoured to the approximate shape of the cast, heated, carefully oriented and pressed against the cast until the layer of compound between the crest of the cast and the tray is about 5 mm. thick. (Fig. 4 B.) It is chilled and the excess compound is trimmed away from the margins, which are then smoothed to prevent injury of the oral tissues. The lower impression is now prepared for the first oral step, by flaming, heating, tempering, inserting and forcibly seating on the mandibular ridge. It is removed and examined, the whole procedure being repeated, if necessary, as previously described for the maxillary impression, until stability has been attained by correct adaptation to the denture-supporting surfaces. Pressure may be applied to the lower impression by placing the index and middle fingers of each hand on the top of the bicuspid region of the tray and the thumbs under the body of the mandible. The tray should be prevented from sliding forward, especially when the ridge is curved upward in the molar regions. In testing the impression, pressure is applied on diagonally opposite surfaces of the tray in an effort to cause tilting or displacement.

Having been tested and accepted as to stability, it is ready to be muscle trimmed; which, for the mandibular impression, is a more exacting operation than for the maxillary. As previously described, the buccal and labial margins are heated in sections and in sequence, beginning at the left buccal margin. A right-handed operator will find it convenient when adapting the left buccal margin to insert the impression with the left hand while the lip is distended by the fingers of the right hand. Muscle trimming is performed by massaging the cheek or lip against the softened compound margin while the impression is firmly held on the ridge. Each section should be tested by pulling the cheek or lip away from the margin. If the impression is forcibly dislodged, that margin should be further muscle trimmed. Likewise, if a margin does not come in contact with the mucosal flexure, additional compound must be added.

In the mandibular impressiogram in Figure 2, the buccal and labial margins show five points (BP, LB, LL, LB and BP) at which the impression must be carefully and precisely adapted. The toleration zone of the mucosal flexure is very narrow in these regions and it may be necessary to muscle trim several times before the margin is correctly adapted. The buccal margins B and B should be as wide as can be tolerated by the mucosal flexure of the buccal vestibule. These margins (B and B) frequently form an angle somewhat greater than 90 degrees with the posterior margins P and P at points BP and BP.

The lingual borders are perhaps the most difficult to adapt. They are not bounded by muscles which automatically determine their form, except at the lingual frenum (SS), beneath which lie the genioglossus muscles. Instead, they are bounded by the mucosal flexure which extends from the tongue to the internal side of the mandible, where it is continuously attached, from the region of the mylohyoid ridge behind to the lingual frenum in front. For convenience in muscle trimming, the lingual borders are divided into two areas, or margins, the mylohyoid (M and M), which lie near the mylohyoid ridge, and the sublingual (S and S), which lie above the sublingual glands, between the mylohyoid ridge and

the lingual frenum. These margins do not lie in a straight line as can be seen by referring to the sublingual (S) and mylohyoid (M) margins in Figure 2. The sublingual margins (S) pass down and back from the frenum (SS) to the anterior extremity of the mylohyoid ridge. Here, the mylohyoid margins (M) begin, continuing up and back to their terminations at the posterior margin (PM) of the impression. The mylohyoid margins (MM) form an angle of approximately 90 degrees with the posterior margins (PP) at angle PM. The impression technic employed in these lingual regions differs from that in general use, in that it makes use of controlled tongue action, by which the lingual margins are adapted to the variable peripheral zone of toleration of each mouth.

The lower impression is prepared for the lingual adaptation by heating and tempering the compound, first along the left mylohyoid margin. It is inserted so as to avoid the tongue, then seated and held down with finger pressure. The thumb is now laid edgewise on the top of the lower tray in front. The patient is asked to bite lightly on the thumb and to force it out of the mouth with the tongue. Meanwhile, the operator holds the thumb in place and the tongue action causes the mucosal flexure in the region of the mylohyoid ridge to adapt the softened compound and, at the same time, to press it snugly against the lingual side of the mandibular ridge. Additional compound may be added and the operation repeated until the mylohyoid margin has been accurately adapted. The amount of tongue pressure is important, and the correct amount must be determined in each mouth by experimentation. The depth of the mylohyoid margin is not predetermined by the mylohyoid ridge, but by the zone of toleration of the mucosal flexure in that region.

Next, the sublingual margin (S) on the left side is muscle trimmed in the same manner. Then the right mylohyoid (M) and sublingual (S) margins are adapted, and lastly the region of the lingual frenum (SS), all of which are conformed by the use of the same tongue action.

Lastly, a thin layer of red compound is traced like a postdam across both posterior margins (P and P), after which it is heated and tempered. The impression is inserted and seated with pressure, and then the index finger is brushed lightly over the distal extremity of both posterior margins so as to make a snug fit. The lower impression is now removed, chilled and tested for retention and stability. It should withstand ordinary efforts to dislodge it and permit free movement of the tongue within normal functional ranges.

The mandibular compound impression may be supplemented by plaster, zinc oxide-eugenol paste or a wax lining. When finally completed and satisfactory, the impression is boxed-in and a cast is made.

SUMMARY

Stability, retention and comfort are sought in the making of complete impressions. First, stability is attained, provided the renitent properties of the ridge are favorable, by proper adaptation of the seating surfaces; secondly, retention is secured by adapting the periphery to the mucosal flexure, and, lastly, comfort is obtained when stability and retention have been attained. The zone of toleration of the mucosal flexure is shown by means of impressiograms. (Figs. 1 and 2.) Preliminary impressions of white compound are made and knife-trimmed to the proper height by means of indelible peripherograms. Study casts are made on which the final tray and impression are prepared. Peripheral adaptation is obtained by the usual muscle-trimming methods, except in the lingual region of the lower impression, where controlled tongue action is used. The length of the mylohyoid margins is determined by the zone of toleration of the mucosal flexure and not by the position of the mylohyoid ridge.

FIXED RESTORATIONS AND THEIR MANAGEMENT

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A FIXED bridge may be defined as an appliance for the replacement of lost teeth which is supported entirely by natural teeth, called abutments, to which it is permanently cemented. This type of replacement should be esthetic or natural in appearance and it must satisfy the requirements of anatomic and physiologic functions in order to serve the purposes for which it is constructed.

The functional aspects involve the problem of stability. This problem is still the most important consideration in fixed bridge construction, and all other factors must be subservient to it.

The second factor, esthetics, is the art and science that determines the conditions which make for beauty, and it is applied when a certain fulness, completeness and harmony exist. This harmony must exist not only between the parts of the object, but also between the object and its surroundings.

Training, environment, character and habits exert marked influence over esthetic judgment. There is no arbitrary standard by which art can be judged. Few among us are endowed with the native ability to create art, and we therefore must observe intently and study diligently the good examples which Nature has placed before us. This artistic sense can only be acquired little by little and to acquire it one must apply himself diligently. A man must work his own way into an object in order to grasp its beauty. Any attempt to create esthetic effects without arduous preparatory study will result in failure. No dissertation on esthetics is necessary here, nor is it within the province of the dentist to speak at length on this subject. Suffice it to say that comparatively little is expected of us esthetically. Our replacements must strive to recreate what is lost. The adopted members must exhibit compatibility with what is left. If compatibility is achieved, the treatment to which we must subject the abutment teeth and the pontics will not be regarded too critically. We must constantly use our ingenuity in seeking ways to create this desirable harmony.

Turning from the esthetic to the mechanical requirements, let us consider in detail the practical points in bringing about satisfactory results. These may be grouped under four headings: (1) the preliminary planning or survey of the tissues involved; (2) preparation of the abutments in the mouth; (3) securing the impressions of the completed abutment teeth, and (4) analysis of the nature and principles of retention. The many other steps equally essential are omitted. Their management is well established and knowledge of them is common to all of us.

Careful planning is essential to a successful result. Obviously, it is too late to consider what the result will be after the anchorage teeth have been cut. A case may present unusual conditions which prevent the perfect attainment of even the most modest ideal. A few of these anomalies are rotation, extrusion, tipping, the presence of fillings or decay,

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anatomic imperfections and malformations, abrasions and variation in diastemata, the size of the pulp and occlusion. These things cannot be considered in a detached, indefinite or haphazard manner.

More than a furtive glance into the mouth, a hazy mental picture and a desire for a happy result are necessary. We need a bill of particulars to deal with these conditions. The irreducible minimum consists of accurate study models, properly articulated, and pontics ground to place so that their final position is the most suitable that can be found after exhausting all possibilities. At this time, the buccolingual width of the pontics is marked with a pencil on the approximating surfaces of the abutment teeth. Next, the areas to be covered by the preparations are blocked out on the abutment teeth, including in them all possible defective portions. Nothing should elude our attention. Then, and only then, is it possible to indicate on the abutment teeth the nature and extent of the preparation for the anchorage pieces. At this point, we have a preview of what the finished product is to be.

Such preliminary study serves a dual purpose: It enables the dentist to carry out the necessary steps with precision, doing neither too much nor too little, and it obviates embarrassing corrections at a later date when such corrections may be well nigh impossible. When the patient must be informed in advance of certain necessary limitations or displeasing features, the assembly on the model makes such explanations easier to comprehend. Confidence is increased rather than diminished, whatever the result may be.

These preliminary steps may seem time-consuming, but they enable the operator, especially one of limited experience, to avoid mistakes which would prove far more wasteful of his time and effort. Because judgment is difficult and experience uncertain, we must cultivate habits of orderly procedure which will divest fixed bridge construction of much of the element of chance and the odium which is attached to it. Without a definite procedure, important trifles may be overlooked. Mistakes may be repeated and progress be impeded. We cannot rely on experience alone. Unless we explain a failure and correct it, the experience is without value. Every step of the procedure must receive equal emphasis if we are not to be robbed of the incentive to carry out a structurally and esthetically pleasing restoration.

While the number and position of the pontics determine the type and extent of the preparations for anchorage, they do not fix the position of the retention grooves on each abutment tooth or their parallel relation to each other. Their position cannot be ascertained by mere guesswork. Position and parallelism are of paramount importance because, without them, the finished bridge can be neither seated nor retained. This is more evidently true in the type of fixed bridge construction under consideration than in the types with which the profession is more generally acquainted.

How is this salutary condition obtained? First of all, the study model is removed from the articulator and securely fixed on the stage of a surveyor. By adjusting the set screw, we obtain the most advantageous position for the model, the position that permits the paralleling of the walls with a minimum of tissue removal. This position also determines the placing of the grooves in the body of the tooth without infraction of the rules of safety and esthetics. After the model is firmly fixed, the straight handpiece is lowered into position with a tapering mounted stone inserted. The abutment teeth are trimmed until the necessary parallelism is obtained, this trimming being confined to the previously outlined areas. A tapered finishing bur of proper size is substituted for the mounted stone and the grooves are sunk

in each abutment tooth within the designated areas. Not only is the position of each groove indicated, but its depth and height on the tooth are determined.

Grooves do not follow anatomic landmarks except by coincidence, nor are they always placed in the long axis of the tooth. They may vary one way or the other as parallelism demands. Unless a surveyor is used, the tendency is to follow the anatomic landmarks, especially in placing the groove between lobes. In cutting occlusal channels, the position of the tooth determines the angle at which the channel floor and its walls meet. This angle may or may not be 90 degrees, this depending on whether the tooth is in a normal or in a tipping relation.

The model thus prepared is the blueprint of what is to be done in the mouth. It is taken to the chair and consulted before each step of the procedure is begun. Faithfully followed, it will eliminate many mistakes and much overdestruction of tissue. The greater the deviation from normal in the position and alinement of the teeth, the more imperative this preliminary blueprint becomes.

As the type of preparation advocated in this paper allows very little clearance in seating the finished bridge, the preliminary survey as above outlined is an indispensable step in its successful consummation. For those not acquainted with the exacting nature of this technic, we cannot stress too strongly the necessity of their familiarizing themselves with each step on the laboratory bench before attempting it in the mouth.

In the mouth, enough tissue is first removed from each abutment tooth to insure parallelism. Brass bands are fashioned and made ready in a manner to be described later. The grooves are cut, first the most accessible and most easily placed, as a guide to the others. After the guide groove is cut, the position of the second groove is outlined with a small knife-edge stone. An impression of this tooth, which is taken with the prepared band, is inspected to determine whether parallelism exists. If not, the correction is made and the second groove is completed. This process is repeated until all the grooves are cut. This method enables the operator to check his work step by step and to correct mistakes as they occur.

The vulnerable point of this type of fixed bridge restoration lies in the failure to secure harmony among the three elements that compose it; namely, grooves, channels and surface walls. The adoption of an orderly technic is our only safeguard against errors.

WAX PATTERNS

From what has been said, it can be readily understood that this method can be used only by one familiar with the indirect method of making wax patterns. While we were engaged in insuring the parallelism of walls and grooves in the abutment teeth, we of necessity, and inadvertently, used the indirect method and prepared the bands for the completion of the work. It is therefore logical and practical to carry on with this method.

For the enlightenment of those who distrust the indirect method, let us point out its superiority. Whenever there is a controversy over the relative merits of the direct and the indirect methods of obtaining a wax pattern, subconsciously supporters of the indirect method are on the defensive. The direct method adherent stakes his claim on accuracy; and, in certain kinds of cavities, his claim is not without merit. If he has a failure, the method is never charged with being the cause. The indirect method advocate, because of his varied and uncertain results, is never able to offer this excuse for his failure because, while the inlay may fit the die, it may not fit the tooth. The more often this discrepancy occurs, the less reason he has to defend his methods.

I have no desire to enter into a con-

troversy over the relative merits of the two systems. I leave the direct advocate to his own devices; but, without doubt, the indirect method has many advantages. With this method, it is easier to obtain a wax pattern, less time is required, a failure to cast is less embarrassing and the finishing is easier. What the method lacks is certainty. It is my purpose to offer a procedure that will insure certainty of result and thus remove the only legitimate objection to its use.

Suppose we were to take an impression of an intact tooth. The occlusal surface and all parts above the largest over-all diameter, commonly known as the height of convexity, would be the only portions of the tooth that would be registered without distortion. All other areas, i.e., those below the height of convexity, converge cervically. Therefore, they would cause binding and prevent undistorted withdrawal. This explains the most frequent cause of distortion in the indirect impression. The same flaw occurs in impressions of a tooth in which a preparation has been cut. Obviously, then, to obtain an accurate impression of the preparation, only those parts of the tooth which are occlusal to the height of convexity should be included with the preparation. This is axiomatic.

The steps by which this is accomplished are as follows: A brass band, smaller in diameter than the tooth, is selected. By means of expanding pliers, one end of the band is expanded sufficiently to pass snugly over the tooth. The expanded portion is trimmed to include the area of preparation and adjacent parts, avoiding those troublesome areas described above. The smaller, unexpanded part of the band serves as a stop or seat, so that when it is filled with impression material, placed over the tooth and with pressure applied, the band will not travel over areas whose inclusion would interfere with easy removal. To determine just what areas should be included in the impression, modeling compound is placed inside the lower border of the band. Thus prepared, it is placed over the tooth and seated. After withdrawal, the outline of the preparation can be readily seen. The band is trimmed to include a small part of the tooth beyond this mark. This method leaves out of the final impression those areas which would tend to bind and thereby prevent the obtaining of a faithful impression. In the anterior teeth, on account of their shapes, the seat is obtained by bending a part of the labial portion of the band over the incisal edge until it rests on the lingual surface of the tooth.

In taking impressions of these prepared areas, in both posterior and anterior teeth, it is necessary to insert and remove the band in line with the direction of the grooves. Because a definite seat has been provided for the band, it can always be seated in the same place upon application of sufficient pressure. Moreover, after it has become stationary, additional pressure can be applied, which will force the impression material into the prepared areas without causing the band to change its position.

This procedure must be modified in those cases in which the space between the band and the prepared area is limited or in which the diameter of the grooves is small. In these cases, the band is only partly filled with impression material and a plugger is used to force the compound into these small spaces. When this has been accomplished, a cone of heated compound is placed in the occlusal portion of the band and uniform pressure is applied. On occasion, even with the most painstaking manipulation, the impression may show flaws. If it does, it can be carefully replaced on the tooth and softened with a stream of sufficiently warm water. Pressure is again applied and the impression chilled and withdrawn.

To insure success with this technic, certain precautions must be emphasized.

These steps must not be slighted or hurried. It is better to make an additional appointment than to be content with imperfect results. The unexpanded portion of the band must not exceed one-eighth inch. A long band increases the leverage and may rock the impression. There must not be an excess of compound, for this will only hinder the seating of the band by offering unwanted resistance in expelling the surplus. The operator must not close the occlusal opening of the band with the finger tip and then try to force the band and compound all the way into position, but should guide the band into position before applying force. The seating of the band is sometimes facilitated if some distant part is left free of compound, to allow better guidance. Last, but not least, we should never include in the impression areas for which there is no use.

If these steps have been carried out properly, the band can be removed very easily. The need for force to remove it is an indication of binding, which must be corrected in order to obtain a proper impression.

The criterion of a practical impression is this: It can be reseated on the tooth with ease and withdrawn without damage. The uniformly good results obtainable by the method just described remove the only valid objection hitherto advanced against the indirect method of making wax patterns. This method places in the hands of the conscientious worker a medium by which he can approach his task with confidence. With complex forms of preparations, in fields difficult of access, in the presence of a copious flow of saliva and other physical conditions which hamper prolonged operation, this method has virtues that are not found in any other procedure.

Retention of the type and form advocated, which will enhance stability in fixed bridge construction, is inextricably tied up with the indirect method. While the direct method advocate can obtain good patterns in certain forms, these forms are not those which lend themselves to unfailing retention in fixed bridgework.

Since we have dealt with a method which implies accuracy, it would be a serious matter not to link its last step, the die making, with the electroforming process. This recently developed process has removed one frequent source of discrepancy.

The universally used amalgam die has several inherent faults: It is made of a material subject to physical and chemical changes, and, in its manipulation, personal equations tend to account for its inconstant results. The electroforming process removes these sources of inaccuracy and, in addition, gives hard margins to which the casting can be finished with extreme accuracy. It is an absolute method, and variations from the true are obviated.

Since I have explained that, by the use of the indirect method, many mechanical forms of retention become possible, it is expected that we should introduce them now, not only because they are novel, but also to place them in areas hitherto considered inviolate. The field for using retention forms becomes widened. Even at this date, we are handicapped by custom and teaching. With this method, forms which appear to us strange or even unsound become adaptable to practical use. We must not only learn by example, but we must also keep an open mind, receptive to new developments and new departures.

The only true explanation for the failure of perfectly executed fixed restorations must lie in the imperfect knowledge of what constitutes rational retention. Retention has been divided into two classes, active and passive. In the passive form, the metallic component assumes the function of holding the abutment tooth in a grip. In the active division, the metallic component is held by the tooth instead of holding the tooth;

the result being that the tooth is gripped by the metallic component instead of merely wearing it.

The scheme on which active retention form depends is the use of one or more tapered keyed grooves whose inner diameters are larger than the entrances to them. The grooves must be placed as far as possible from the axis of rotation and must be opposed to each other. They must be long enough to end in the gingival half of the crown. Stability is increased in direct proportion to the vertical parallelism obtained and to the character of the keyed grooves.

In most fixed bridges, the forces of mastication tend to be resolved, in torsion, around a central axis of rotation. Hence, it becomes judicious to place the retention areas, whenever conditions allow, as far as possible from this axis, which acts also as the fulcrum point around which the levers of force and retention move. In actuality, this axis is represented by a line coinciding with the central grooves of the teeth.

Active retention form entails little actual tissue removal. This is especially so in removal of dentin, for only the axial grooves are placed in that tissue and their diameters usually need not exceed that of the No. 702 tapering bur in molars, and the No. 701 in anterior and bicuspid teeth. Rigid adherence to these sizes, however, is not necessary and may be modified by the presence of decay or fillings, proximity to the pulp and the structure of the tooth.

From the standpoint of safety to the pulp, the lock-groove channel preparation has two distinct advantages: Usually, just enough tissue is removed to insure parallelism, and this does not endanger the pulp. The fact that the retention grooves are placed outside the axis of torsion brings them into the areas most distant from the pulp, and the danger of involvement is diminished. In converting an existing box preparation into one of active retention, grooves should be placed in the cavosurface walls. The occlusal channels that connect the grooves need not be carried to a greater depth than 2 mm. Enamel loss, never serious, is governed by the paralleling of the walls for withdrawal of the impression, and this varies with the anatomic form. All finishing is done on wide beveled enamel margins. Therefore, recurrence of decay in portions of the tooth inaccessible to the toothbrush is not probable.

Another significant advantage of the active retention form, not practical elsewhere, is the saving of the cusps of the posterior teeth from obliteration. Left standing, they are incorporated in the scheme of retention to serve as binding posts for the anchor piece. When they are lost, their exact reproduction is difficult, and the increased area of the casting is subjected to additional forces, which can be better borne by the tooth itself.

Only forces applied in the opposite direction to its insertion can loosen the active retention form of anchorage from its tooth. Such forces are artificial, not natural. The active part which the tooth exerts in holding the casting in place is shown by the fact that, in order to remove the cemented anchorage, it often must be divided into as many parts as there are keyed grooves. Each must be removed separately. Force alone will not dislodge this type of construction.

A pleasing corollary to this type of preparation is to be found in the fact that the natural contact between an abutment tooth and its neighbor can often be left intact. Often, after unnecessary intrusion into this area, the difficulty of preparation has been augmented and the natural economy of the tissues impaired. If proximal caries exists, or if a general tendency toward it is suspected, that area may wisely be included in the preparation. A sound filling already in place, not involving areas in which retention

grooves are to be placed, may be left *in situ*.

In dealing with the anterior teeth, unless the structure calls for more than two pontics, it is not necessary to place grooves on both proximal surfaces. Because retention is not contingent on the volume and physical properties of the metals employed, heroic excavations are out of place. In the anterior teeth, while torsion tends to unseat the bridge, the principal forces are those of shearing and impaction.

In all these preparations, there is a desire to keep all margins in areas of easy operation which are also accessible for finishing and for the maintenance of hygiene. Therefore, if it is necessary to restore the opposite proximal surface, it is often preferable to use a separate filling.

Naturally, throughout this presentation, ideal conditions are portrayed. It is impossible to deal with the innumerable variations that are met in everyday practice. My purpose is accomplished if the fundamental, underlying principles have been made clear. Details of procedure should be modified to meet actual mouth conditions, and this can be done without departing from the principles given.

Next in importance is the necessity of definite orderly procedure. This not only prevents the operator from overlooking important details, but also enables him to conserve his time and energy. Sometimes, when the mouth is first examined, what is disclosed seems fraught with perplexities. Usually, there are conditions which modify the first judgment and so the operator of average skill should not be dismayed. For instance, bridges need not always be soldered at both ends. When a rest type is used, the preparation at the free end may be of the usual mortised inlay construction.

DIAGNOSIS

Up to this point, certain procedures have been described which deal with treatment planning, retention and the indirect method of construction. Indispensable as these steps are, I cannot close without drawing attention to certain salient features of diagnosis.

A detailed discussion of this subject cannot be included here, but it must be stated that a dentist is only qualified to prescribe a rational treatment when he is able to foretell the probable issue of a condition allowed to follow its natural course without remedial interference. Neither is he justified in making a restoration the probable effects of which he does not know. This stresses the importance and necessity of careful diagnosis, based on conservation of tissue and function and on esthetic considerations. We must study with particular attention the natural history of tissue loss and its subsequent changes, dealing particularly with the tendencies to a favorable or unfavorable issue. Because restorations create a new environment for the living tissues and organs supporting the prosthesis, it is well that this new relationship enter into decisions, as it is a factor of no mean consequence. Therefore, to dwell impressively on and to be preoccupied solely with the mechanics of restorations without taking cognizance of the biomechanical principles that govern their efficiency and management reduces us to the status of mere technicians in the art.

If the methods described in this paper appear complex, they should not be tried at once and then abandoned if immediate success is not attained. Increased appreciation of their value will come with experience. The more familiar one becomes with these methods, the more he will apply them.

Complex as the methods may seem, they are the result of years of experience and refinement. True simplification comes from the gradual shedding of much that we retain only because it always has been embodied in our teaching

and practice. We recognize that simplification may be carried too far. The method outlined represents the simplest system that has proved practicable and upon which one may build with assurance that progress will be his reward. It is wise to dwell within the confines of experience born of many years of usage, before venturing into untried fields.

CONCLUSION

As these restorations are mechanical in their elements and parts, they should be the exemplification of certain fundamental rules. After these rules have been learned, complex cases can be recognized merely as unusual modifications which readily yield to indentical management. The severity of the abnormalities which puzzle us is of degrees. The methods employed for their management are identical. The rules that govern the solution of a complex case are those that govern the solution of the simplest. Therefore, we must recognize the value of establishing procedures that will assure exactitude and will equip the user with a knowledge of how to proceed directly and with precision in handling any given case. The dentist has at his command many and varied abilities, each of which he knows thoroughly. It is essential to master typical preparations and procedures, but it is more advisable to learn the fundamental principles that enable us to introduce change when function dictates deviation.

There will be some who take issue with this presentation by saying that the substance with which it deals is neither new nor indispensable. Granted that this is so, the fact remains that, too often, study models are only partially studied. More often than not, they are merely looked at, and reliance is placed on the senses alone to find a way out of a dilemma. Frequently, the results are disappointing. When the work is completed and the prosthesis is placed in the mouth, we often wish that we had handled the construction differently. This wish can be fully satisfied if we first complete every step of the foundation work on the model in the manner that the draughtsman details his work on his board. True, in many cases, the senses are a sufficient guide to success; but blind reliance on the senses makes success sporadic. Rule of thumb measures, apparently economical of time, are often attended by mediocre results. Those for whom the gods lay by great stores of gifts from which to draw may dispense with such aids as have been detailed here. They are natural operators. Others, less fortunate, will achieve success only by hourly labor and application. They will overcome deficiencies by making use of aids which extend the senses beyond their natural limitations. Surely, planned restorations will lead to better efforts, which will reflect credit on the operator as well as on the profession.

Eaton Tower.

PIGMENTATION OF THE FACE FOLLOWING X-RAY EXAMINATION OF THE JAW

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THOUGH it is generally recognized that cutaneous pigmentation may occur as a result of roentgen-ray therapy or repeated and prolonged roentgen examination, it is exceedingly uncommon to observe this reaction after a single dental roentgen-ray exposure. Search of the literature reveals no recorded case of such a phenomenon without preceding erythema. From a medicolegal standpoint, it is also important to emphasize that there may be such a reaction even with an exact and proper technic, and that it is dependent on a state of the skin peculiar to the individual.

REPORT OF CASE

M. S., a colored girl, aged 19, a native of Puerto Rico, was admitted to the Mount Sinai Hospital Dispensary February 11, 1940, complaining of a brownish "spot" on the face. She was referred to the skin clinic for examination and opinion as to the cause and nature of the pigmentation. She had been in good health except for the recent development of a dental infection. In the course of treatment at a municipal dental clinic, she noticed the brown "spot" thirty-six hours after a roentgenologic examination. (Fig. 1.) There had been no preceding redness, tingling or other subjective symptoms except those from the toothache. No chemicals or other possible irritants had touched the skin. Although it was not possible to obtain the exact calibration of the machine that had been employed, it was ascertained that the exposure factors included 120 kv., 8 ma., 0.5 mm. of aluminum filtration, skin contact and exposure time of 4.5 seconds. The number of roentgen units to which the patient had been exposed corresponded with that used in thousands of other cases. The single exposure probably constituted less than a small fractional skin dose.

The past history indicated that the patient had always been well. Her mother was white and her father a full-blooded Negro. There was no family history of abnormal pigmentation.

In view of the probable roentgenologic origin of the pigmentation, it was decided to test the cutaneous reaction of the skin to roentgen ray exposure, to determine the threshold and to establish a possible relationship. Three exposures consisting of 150 roentgen units, 200 roentgen units and 250 roentgen units were given through a circular cone to the left side of the face, the inner surface of the left thigh and the inner surface of the right thigh respectively. These dosages were all given with an exposure formula of 60 kv., 3 ma. and 15 cm. focal skin distance, with no filtration. The patient was again observed after a three-day interval. At this time, it was noted that the left side of the face, which had received 150 roentgen units, showed a very slight increase in pigmentation. The left thigh showed a slightly pigmented irregularly bordered circle and the right thigh presented a sharply-defined well-pigmented circular area corresponding to the roentgen-ray cone in size and shape. Further observation at intervals of several days showed a progressive increase in pigmentation until about the seventh day. At that time, all the exposed areas were clearly pigmented, corresponding in size to the cone employed. From these findings, it was concluded that the melanoderma was due to irradiation of the skin.

COMMENT

Pigmentation of the skin during the course of x-ray therapy is fairly com-

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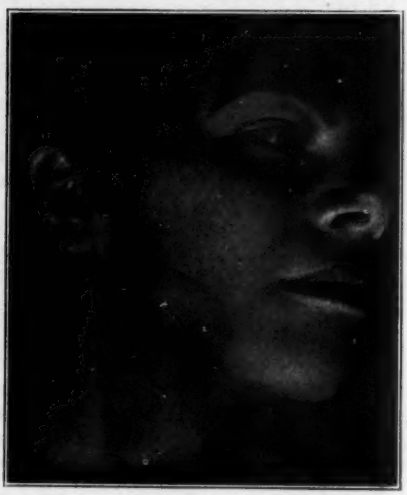
mon. This is usually observed when the skin has been exposed to several small fractional doses or after an intense dose. Such pigmentation is as a rule preceded by erythema of varying degree. It may follow a very mild reaction and disappear after several weeks. A moderately severe pigmentary change may persist for several months and even for a year or two. The pigmentation may occur as circumscribed or diffuse areas. After very severe reactions, as after a third-degree radiodermatitis, the pigmentation may be prominent, and other sequelae of chronic radiodermatitis are evident, such as telangiectasia, atrophy of the skin, including that of the sweat and sebaceous glands, nail deformities and defluvium, alopecia and keratoses. It is usually observed as small or large irregular patches in the neighborhood of epitheliomatous and ulcerative lesions. In the so-called cases of electric dermatitis, pigmentation may occur with or without preceding erythema. This condition is due to the electric discharges which result when the rays pass through heavy metals which are in contact with the skin. It may be prevented by grounding the metal or interposing a sheet between the metal and the skin.



Pigmentation of face after x-ray examination of jaw.

No case similar to that reported in this paper has been found in the literature although roentgenograms are taken in great numbers every day throughout the country. Pigmentation following irradiation is of common occurrence, but it is usually preceded by erythema and does not occur unless at least 300 roentgen units have been administered. In a recent study, MacKee and Cipollaro[1] demonstrated that the erythema dose for filtered radiation with 137 kilovolts and with 0.5 mm. of aluminum is 400 roentgen units; with 1 mm. aluminum, it is 450 roentgen units, and with 3 mm. aluminum, it is 550 roentgen units. In their series of thirty-four subjects selected at random, at least 300 roentgen units was necessary to produce pigmentation. However, in most of these cases, erythema preceded pigmentation except for those receiving filtration of at least 3 mm. of aluminum. In addition, pigmentation did not occur for at least four to seven days after irradiation. In this patient, pigmentation appeared within thirty-six hours and after an extremely small roentgen dosage. The reproduction of the lesion with only 150 roentgen units indicates that in this patient, pigmented areas would follow exposure to a roentgen dosage administered routinely to thousands of dermatologic patients.

It has been known for many years that the skin of young persons with dark complexions tends to be more sensitive and shows more marked pigmentary reactions to irradiation whether the source be ultraviolet or roentgen rays. It is also known that dosage expressed in roentgen units gives little information concerning the biologic reaction. In this case, we believe that the biologic factors, such as race, color, age and endocrine status, were of much greater importance than roentgen dosage in the production of the lesion.

The patient has a dark complexion and is readily tanned. Women in general are more sensitive to radiation than are men. It must also be remembered that where the circulation is poor, changes are more apt to occur, and it is a recognized fact that certain parts of the skin, such as the face and flexor surfaces, are less resistant to radiation.

SUMMARY

1. The phenomenon of pigmentation of the skin occurred on roentgenographic examination of the teeth.

2. The pigmentation appeared without preceding erythema or other subjective or objective symptoms.

3. The importance of the biologic reaction rather than the roentgen dosage is stressed.

4. The pigmentation is not permanent and will disappear within several months without any sequelae.

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CLINICAL AND BACTERIOLOGIC STUDIES ON DENTAL CARIES

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IT is generally accepted that dental caries is a bacterial disease. In spite of the many investigations that have been reported, there has not been, as yet, sufficient properly controlled evidence presented to definitely establish the causative micro-organism or micro-organisms. This is probably due to the heterogeneity of the oral flora. Not only are there many different forms of organisms, with innumerable variants of each, present, but, in addition, the bacterial picture is continually changing.

Study of the bacteriology of dental caries may be approached: (1) by studying the bacteria removed from localized areas on the teeth; (2) by culturing selectively certain specific organisms from the mixed flora and determining their association with caries activity, and (3) by studying all the organisms found in representative samples of the mixed oral flora and comparing the differences in caries-active and caries-free mouths. This report covers studies made by the first and second methods, as only recently we have instituted a program for studying all of the organisms found in carious and non-carious cases.

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Read before the Section on Therapeutics, Pathology and Research at the Seventy-Sixth Annual Midwinter Meeting of the Chicago Dental Society, February 12, 1940.

PART I: THE BACTERIAL PLAQUE

By the use of ground sections of human teeth prepared for microscopic study, we have demonstrated the presence of the bacterial plaque on the outer enamel surface. In some instances, we found an early carious lesion beneath this feltlike mass of micro-organisms; while in others, the enamel beneath the bacterial plaque appeared to be normal. Obviously, it is impossible to prepare ground sections of

human enamel thin enough to permit study of the morphology of the bacterial cells within the plaque. The thinnest sections showed a dense feltlike mass with long filamentous forms protruding from its outer surface. To go beyond this point in the study of the cellular morphology of the carious and non-carious bacterial plaques, another method of examination had to be developed.

It seems pertinent to know what organisms can be consistently recovered from enamel surfaces which show only the earliest stages of dissolution if we are to have an accurate understanding of the bacteria which play a part in the development of the carious process. So far as we have been able to observe, the cultural methods more commonly employed to date do not give an accurate account of all the micro-organisms found in the plaque. In the final analysis, the micro-organism or micro-organisms which are responsible for the initiation of caries will not be fully understood until they can be recovered regularly from enamel surfaces prior to the development and during the early stages of the carious lesion in the enamel and are absent or sporadically present in areas that are not and do not become carious within a reasonable period of time.

In an effort to study the organisms in the dental plaques, and to differentiate the cell forms encountered in plaques over actively carious areas from those found in non-carious areas, we undertook the examination of direct smear preparations. By the study of these direct smears, with full knowledge of the state of the enamel surface at the time the plaque was removed, which was determined by both a clinical and a roentgenologic examination, it gradually developed that there is a morphologic difference between the micro-organisms found in plaques removed from carious areas as compared with those recovered from non-carious surfaces.

Gradually, the study of smear preparations of the plaque material was carried forward to the point where it now appears possible to predict with reasonable accuracy the state of caries activity without knowing the clinical condition of the enamel. In order to determine the extent to which it was possible to predict the clinical condition of the areas from which the plaques were removed, one of us (J. R. B.) studied several hundred smears submitted by dentists in private practice. H. J. Noyes has reported a comparison of the existing clinical condition with the diagnosis as determined by the study of smear preparations. (Tables 1 and 2.) This report indicated agreement between the clinical and laboratory findings, which suggests that it is possible to recognize a difference in the bacterial mass recovered from either active or inactive areas.

Since it has been generally accepted by most of the workers on the caries problem that aciduric micro-organisms are associated with the carious process, we have attempted to investigate the

TABLE 1.—STUDY OF SMEARS

Classification	Cases	Lesions	Number	Smears Positive Per Cent	Smears Negative Per Cent	Examinations All Positive Smears Per Cent	Examinations All Negative Smears Per Cent
Immune	10	0.0	53	7.5	92.5	0.0	70.0
Relatively immune	24	4.1	151	13.9	86.1	0.0	46.6
Relatively susceptible	24	10.2	156	35.3	64.7	6.8	17.2
Susceptible	6	19.3	49	81.6	18.4	62.5	12.5

relationship between the smear and cultural methods of study when a medium adjusted to a pH of 5.0 is employed. At the time of gathering material for smear preparations, a small amount is transferred to Jay's medium or a suspension is spread upon Kulp's tomato-agar. Each method of study was carried out independently and by a different worker. The results were not compared until each investigator had reached his conclusions. The cultural studies were reported as either positive or negative, while the smears were classified in four groups; namely, positive, positive question, negative and negative question. Whenever the examiner of the smear preparations was in doubt, the case was placed in the questionable groups. If the material appeared to be more on the positive side, but was not typical or clear cut, the classification of positive question was employed. When the trend was more to the negative, the notation of negative question was used. Tables 3 to 6 give the results of these two methods of studying the plaque material.

TABLE 2.—CLINICAL CONDITION AND DATA ON SMEARS

Clinical Condition of Tooth Surface	Smears		Examinations	
	Positive Per Cent	Negative Per Cent	All Positive Smears Per Cent	All Negative Smears Per Cent
Positive	73.1	26.9	59.3	18.7
Negative	13.3	86.7	1.7	71.4

DISCUSSION

In the analysis of those cases which were designated as questionable in the smear studies, it is interesting to note that out of a total of fifty-six such cases, in thirty, or 53.56 per cent, the smear findings tended to agree with the cultural findings. In reviewing the notes on the cultural studies with George Hartley, Jr., who carried out this portion of the investigation, we frequently found a statement that either rough or intermediate colonies developed in those cases grouped as positive question. Again, when the cultural findings were positive and the smear reports were negative, the data sheets often revealed that only a few colonies grew on the Kulp plates. Sometimes, only one colony developed on the entire plate. Obviously, when aciduric micro-organisms are so few in the plaque material, they may not be recognized in the smear preparations.

It is also doubtful whether plaque material containing such a limited number of aciduric micro-organisms is capable of attacking the enamel surface. Most of the cases which grew out as either group I or II in the Hadley classification of lactobacilli were recognized in the smears as positive, and it also appears that the greatest clinical activity is observed in those cases in which the smears contain either coccobacilli or short parallel rods. From this study, it is our impression that whenever a heavy growth of lactobacilli occurred on the tomato-agar plate, the smears were regularly strongly positive, and that the enamel surface from which the material was gathered showed evidence of caries activity.

It is to be noted that all smears consistently showed forms of micro-organisms other than the lactobacilli and that only lactobacilli, yeast and sometimes a few streptococci developed on the culture medium that was employed. We interpret this to mean that the development of a caries-producing bacterial plaque, firmly adherent to the tooth surface, requires micro-organisms other than potential acid formers. Black emphasized the necessity for the confinement of the acid in intimate contact with the enamel. Our ob-

servations to date suggest that some micro-organism or micro-organisms other than lactobacilli are required for the formation of caries-producing plaques on the smooth surfaces of human enamel. The fact that we have never recovered from such surfaces a plaque composed entirely of lactobacilli or yeasts may explain why the feeding of lactobacilli in milk has failed to produce caries in immune subjects.

Clinically, it is well known that initial carious lesions involving smooth surfaces of the enamel are found only in certain limited areas. Therefore, it is very important that the material for examination be obtained from the same limited areas, if accurate findings are to be expected. We recognize the fact that initial lesions on the proximal enamel surfaces are found just gingivally from the point of contact. Plaque material removed from areas of the proximal surfaces other than immediately gingival to the contact point will not give an accurate impression of the condition. Recently, we have adopted the technic of using the mechanical separator together with thin-bladed instruments of special design in order to reach the area in which initial caries is found. Again, it is important to remove all food débris and extraneous material before attempting to "lift" the plaque from the tooth surface. This method has been found useful in determining the caries activity of a specific area of human enamel. Frequently, the clinician encounters areas of etching on enamel surfaces and desires to know whether the process has been arrested or whether it is active at the time of examination.

TABLE 3.—RESULTS OF STUDY

	Number	Per Cent
Cases studied by culture and smear methods	279	
Cases in agreement by both methods	187	67.02
Cases in disagreement; i.e., one method positive, the other negative	36	12.9
Cases with questionable smear reports	56	20.07
		99.98

PART II: SELECTIVE CULTURE METHOD

This portion of the study was conducted to determine the incidence of specific micro-organisms in caries-active and caries-free mouths by culturing the specimen on a selective medium. The method of sampling employed gave us a representative sample of the micro-organisms found on the surfaces of all the teeth. Because lactobacilli have been frequently associated with caries, we have believed that a study of their incidence in a large number of patients over extended periods of time would be of value.

TABLE 4.—DISTRIBUTION OF CASES IN DISAGREEMENT

	Number	Per Cent
Cases	36	
Cases with negative cultures and positive smear reports	20	55.55
Cases with positive cultures and negative smear reports	16	44.44
		99.99

The study thus far includes approximately 6,300 specimens gathered from 700 patients over a period of three years. Samples were obtained by having the patient chew a small piece of paraffin and collecting the saliva. As a rule, about three minutes was necessary to collect 10-15 cc., although occasionally a longer time was necessary. It is customary to call the specimen thus obtained a salivary sample. As a matter of fact, we are trying to get a representative sample of the bacterial flora present on the teeth. The saliva merely acts as a vehicle for recovering the micro-organisms that are dislodged by the act of mastication.

The samples were immediately placed in a refrigerator and within twenty-four hours were plated on Kulp's tomato-agar adjusted to a pH of 5.0. One-tenth cubic centimeter of the saliva, as collected, or

a dilution of one to ten or one to a hundred, was spread on the plate and incubated for four days, and the colonies were counted under a low-power microscope. The organisms that grew up were classified into morphologic groups 1, 2, 3 and intermediate lactobacilli, and the numbers of each recorded. Studies by R. W. Harrison, of our bacteriology laboratory, have shown that the fermentation and immunologic reactions do not parallel the morphologic grouping. For this reason, only the total number of lactobacilli are indicated in this report. The yeast organisms were also counted and recorded.

The caries activity was determined on the basis of a careful clinical and complete roentgenographic examination. In about 50 per cent of the patients, a new and complete examination was made each time a specimen was collected. The other 50 per cent of the patients were treated in the clinic, and were reexamined periodically. The records of the clinical examination were adjusted each time a specimen was obtained, to indicate the number of carious lesions present at the time the specimen was taken. In view of the fact that the clinical picture was continually changing in many of the patients, it was found advantageous to use a caries index similar to Bodecker's, to record the number of lesions present, together with the past caries experience of the patient. In this disease, with multiple foci or areas of initial attack, and with the tendency to spread and involve other potential areas, we must select some arbitrary basis for such an index. Our index consists of two numbers, the first of which indicates the number of tooth surfaces that have been treated by restorations or extractions, and the second, the number of active carious lesions present.

There are approximately 120 potential areas of initial attack in the complete permanent dentition and about sixty potential areas in the deciduous dentition. Our observations are recorded in terms of the number of discrete lesions present, even though, in cases of advanced caries, two or more potential areas might be considered as one lesion. This method may not be satisfactory for statistical surveys of large groups, but for a long term horizontal study like ours, it is preferable.

In children with mixed dentitions, it was necessary to use two sets of numbers, one to record the findings in the deciduous dentition; the other, the findings in the permanent teeth. Questionable areas and areas of arrested caries are recorded separately. A detailed record of the original examination, together with the caries index, calculated each time a specimen was obtained and arranged in chronologic order, furnishes

TABLE 5.—DISTRIBUTION OF CASES WITH QUESTIONABLE SMEAR REPORTS

	Number	Per Cent
Cases	56	
Cases with negative culture and positive question smear reports	23	41.07
Cases with positive culture and negative question smear reports	3	5.35
Cases with negative culture and negative question smear reports	17	30.35
Cases with positive culture and positive question smear reports	13	23.21

TABLE 6.—TABULATION AFTER REEXAMINATION OF CULTURE DATA SHEETS

	Number	Per Cent
Cases studied by both methods	279	
Cases in agreement on first analysis	187	
Cases with positive culture and negative smears	16	
Cases where trend of smears were in agreement with culture	30	
Cases in agreement on second analysis	233	83.51
Cases in disagreement:		
Negative culture with positive smears	20	7.16
Negative culture with positive question smears	23	8.24
Positive culture with negative question smears	3	1.07
	279	99.98

us with a convenient and accurate indicator of the caries activity and the changes that occur.

In this study, we recognized the inherent difficulties of accurately appraising the oral cavity for caries activity by clinical methods. The presence of cavities *per se* does not necessarily indicate that active caries is present at the time the examination is made. It is necessary to demonstrate the development of an initial lesion on a previously intact tooth of teeth every three months from the time they erupt. Once the integrity of the external surface is destroyed, the process may be markedly accelerated. Studies of any of the factors in the caries process, whether dealing with the local environment, such as the saliva and the oral flora, or with the systemic relationships, such as the diet, must be carried on over long periods of time. Single observations or determinations of these relationships are of little value.

The carious process may or may not be a continuous one. It is not uncommon to see areas of enamel decalcification or even more advanced lesions remain unchanged for many years. This remission or arrest of the carious process may be due to any one of a number of conditions. Unless we have positive proof to the contrary, the extent of the carious involvement, as we observe it, represents the total caries experience of that tooth from the time of its eruption; and no interpretation can be made as to when the lesion was initiated or its rate of progress.

surface or to demonstrate the extension or increase in the size of the lesion. It may be that failure to take this point into consideration is responsible for the disagreement that exists among some investigators.

Dental caries is, in most instances, a chronic disease. It usually requires many months and sometimes years for the lesion to reach the stage where it can be detected macroscopically. This fact can best be appreciated by the examination

TABLE 7.—CARIES ACTIVE PATIENTS

	No. Patients	No. Samples Caries Present	No. Positive for Lactobacillus	Per Cent Positive
Untreated	132	696	563	80.9
Partial treatment	138	1442	1169	81.1
Complete treatment	55	440	324	73.7
Two periods of treatment	76	778	570	73.3
Denture cases	73	564	376	66.6
Total	477	3920	3002	77.6

TABLE 8.—CARIES FREE PATIENTS

	No. Patients	No. Samples	No. Positive Lactobacillus	Per Cent Positive
Caries free	25	149	34	22.8
Questionably caries free	20	120	36	30.0
Denture cases	11	64	14	21.8
Total	56	333	84	25.2

TABLE 9.—SUMMARY OF THE RESULTS OF CULTURES OF THE SPECIMENS OBTAINED FROM PATIENTS WEARING ARTIFICIAL DENTURES

	No. Patients	No. Samples with Dentures	No. Positive Lactobacillus	Per Cent Positive
Complete dentures (caries active)	40	364	286	79.1
Partial dentures (caries active)	30	300	246	82.0
Complete dentures (caries free)	11	123	80	65.0
Partial dentures (caries free)	5	25	24	96.0
Unclassified	17	279	263	94.2
Total	103	1091	899	82.4

Samples obtained during edentulous period, 185 samples from 45 patients—20 positive for lactobacillus.

It is needless to point out the difficulties of distinguishing between early pit and fissure caries and anatomic defects; or the difficulty of determining and recording the size of a carious lesion. It is only by repeated scrutinizing, using all the clinical diagnostic methods available, that a fairly accurate estimate of caries activity can be established. The results reported here include only those cases from which three or more specimens were obtained.

RESULTS

A total of 5,418 samples were obtained from 477 patients giving evidence of caries activity during the period of observation. (Table 7.) A total of 3,920 samples were obtained during periods when macroscopic lesions were present. The remainder were collected at periods when gross lesions could not be demonstrated. Of the 3,920 cultures, 3,002, or 77.6 per cent, were positive for lactobacilli.

In 85, or 18 per cent, of the patients, lactobacilli were present in less than 50 per cent of the samples. In the remaining 392, or 82 per cent, of the patients, lactobacilli were present in 85.4 per cent of the samples. This indicates that even though the correlation is high, occasional negative samples are obtained.

The group of caries-free patients included those in which no gross lesions could be demonstrated and who had had no treatment for caries for the past five years. (Table 8.) A total of 333 specimens were obtained from fifty-six patients. Of these, eighty-four, or 25.2 per cent, were positive for lactobacilli. In no case were the organisms consistently present, and whenever the cultures were positive, the number of organisms was usually low.

Early in the study, we collected some samples from patients wearing complete artificial dentures. The findings suggested that a more detailed study of these cases would be of interest. Subsequently, we collected samples from fifty-one patients for whom artificial dentures were to be constructed, during the period when the natural teeth were present, during the edentulous period and after insertion of the artificial dentures.

In seventeen artificial denture cases (Table 9), we had no record of the condition of the natural teeth. Seventy patients showed caries activity and sixteen patients were caries free. Of the 1,091 specimens obtained from patients wearing dentures, 899, or 82.4 per cent, were positive for lactobacilli. In most cases, the negative samples were obtained within the first two weeks that artificial dentures were worn. Once the organisms were established in the mouth, they could be recovered consistently. This finding seemed to be independent of whether the patient was previously classified as caries active or caries free. Only two of the 103 patients failed to show lactobacilli consistently when the artificial dentures were worn regularly. Of 185 samples obtained during the edentulous period, only twenty were positive, with very low counts.

When few lesions are present, the percentage of negative samples is higher than when many lesions are present. There is also some tendency for the counts to be higher as the number of lesions increases, but the differences are not very striking.

ORAL TUBERCULOSIS AS THE INITIAL MANIFESTATION OF RAPIDLY PROGRESSING FATAL TUBERCULOSIS

By Leon H. Collins, Jr., M.D., and Thomas J. Cook, D.D.S., Philadelphia, Pa.

THE purpose in reporting this case is to draw attention to the fact that oral tuberculosis may exist before rapidly progressing tuberculosis in other parts of the body has manifested itself. The incidence of oral tuberculosis in cases of known pulmonary tuberculosis is generally considered to be low. Representative figures are 1.4 per cent[1] and 0.4 per cent.[2]

REPORT OF CASE

History.—A 17-year-old girl of Irish descent was first seen by one of us (T. J. C.) April 21, 1939, because of an ulcer on the gums (Fig. 1) which had been present since February. No trauma had preceded its appearance and the patient was not subject to aphthous ulcers. Her only other complaint was that, for three weeks prior to the examination, she had noted "water" running from her left ear, and with this she had noted some impairment in hearing on that side. Her medical, family and social history seemed irrelevant.

Examination.—A general physical examination (L. H. C., Jr.) April 21 revealed a generalized dry and scaly skin; moderate impairment of the percussion note, but no râles over the apex of each lung posteriorly, and a chronic ulcer measuring 2 by 3 cm. on the lower gums, just to the left of the midline. The ulcer was shallow, and was covered by a grayish exudate. It appeared indolent. There was little evidence of activity at the edges and the lesion was not very painful.

From the Thoracic Section of the Medical Clinic of the Hospital of the University of Pennsylvania and the Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania.

The patient was then studied in the Thoracic Clinic of the Hospital of the University of Pennsylvania. No change could be noted in the oral lesion. The percussion note was impaired over the apices of the lungs posteriorly, but no râles could be heard. The blood count and urine examination were normal. The blood Wassermann reaction was negative. The laryngeal examination was negative. Aural examination revealed left-sided subacute otitis media. No sputum could be obtained for examination. A chest x-ray examination May 1 was reported as follows: "Bilateral apical tuberculosis. There are multiple exudative lesions in the right apex and a lesser number in the left. There are two primary complexes in the right upper lung field." Smear and culture of the oral lesion revealed no significant organisms.

Course.—May 4, thirteen days after the original examination, the patient awoke with a severe throbbing headache and a feeling of nausea, which was followed by vomiting. She perspired profusely. After failing to improve at home for three days with symptomatic care, she was admitted to the Hospital of the University of Pennsylvania. In this interval, she had had a continuous headache and drowsiness. She was constipated and had been able to retain only orange juice. On the day of admission, a spontaneous nose bleed had lasted three minutes.

On admission, the temperature was 105°F.; pulse, 96; respiration rate, 26, and blood pressure, 124/70. The patient was conscious and cooperative, but acutely ill. Her face was flushed and she was perspiring profusely. She complained of headache. There was moderate enlargement of the cervical lymph nodes but no mastoid tenderness. The ocular fundi were normal.

The left aural canal was filled with thick

creamy pus, removal of which revealed a perforated drum. There seemed to have been no change in the appearance of the mouth lesion since the time of the first examination. There was no rigidity of the neck. Cardiac and abdominal examinations were negative. Physical examination of the chest now revealed a few râles at the right apex posteriorly. The percussion note over the apices was still moderately impaired.

Laboratory Data.—Laboratory studies revealed 80 per cent hemoglobin and 12,000 leukocytes, of which 71 per cent were polymorphonuclears, 25 per cent lymphocytes and 4 per cent mononuclears. Blood sugar, blood urea nitrogen and urine examinations were normal. The chest x-ray findings May 9 were reported as follows: "Probable bilateral apical tuberculosis. The bedside examination shows no change in the appearance of the chest. There has been no extension of the lesion to the lower lung field."

Spinal fluid examination May 9 was normal except for twelve mononuclear cells per cubic millimeter. May 11, the spinal fluid became cloudy and the pressure increased. There were 130 leukocytes, of which 97 per cent were mononuclears and 3 per cent polymorphonuclears.

Outcome.—Two days later, signs of meningitis had become increasingly prominent. The neck was stiff and Kernig's sign was positive. The patient was now comatose and incontinent. Two days later, it was evident that the external rectus muscle of the left eye was paralyzed. Because of the cloudy appearance of the left mastoid on x-ray examination, this area was explored at this time. No pus could be found. Three days later, lumbar puncture revealed pressure about three times normal, and 11 cc. of cloudy fluid was removed. Within the next two days, the external rectus of the right eye became paralyzed. The following day, the skull was trephined for ventricular tapping. The ventricles were found to be greatly dilated. Chest x-ray examination May 18 was reported as follows: "Bilateral apical tuberculosis. No evidence of a miliary spread." Search for tubercle bacilli in the circulating blood was not made.

Death occurred May 20. The patient had been comatose for the last seven days of her life.

Necropsy.—Necropsy (L. K. Garron) revealed bilateral pulmonary tuberculosis of the upper lobes, tuberculous meningitis and tuberculous ulceration of the mucous membrane of the mouth. No tuberculosis was found in the liver or spleen. The right lung weighed 250 gm.; the left, 240. Both showed nodules and fibrous pleuritis over the apices. On section, the nodules showed scarring of the lung tissue as well as a few areas of caseation, which did not show calcification. Microscopically, scattered tubercles were seen throughout the lungs. Smears and cultures of the brain showed tubercle bacilli. Histologic examination of the mouth lesion revealed ulceration of the stratified squamous epithelium of the gum extending down into the submucosal areolar tissue. The ulcerated area was necrotic and crater-shaped. A number of typical giant cells were seen at the base and a moderate number of lymphocytes were in the neighborhood. The underlying muscle tissue did not appear involved. Acid fast stains did not reveal tubercle bacilli.

Shallow ulcer just left of midline and covered with grayish exudate.

COMMENT

A survey of the literature emphasizes the fact that oral tuberculosis is usually found in patients who have pulmonary tuberculosis. There is a difference of opinion concerning the mechanism by which these lesions develop. One of the chief points of interest in these cases is the question as to whether the infection in the mouth arises from infected sputum or from tubercle bacilli contained in the blood or lymphatic stream. As in our case, the evidence presented in some in-

stances does not permit a reconstruction of the probable course of events clinically.

In all of the cases of Ivy and Appleton,[3] pulmonary tuberculosis was present. The patients were all men and all recovered. The ages were 52, 30 and 49 years.

Darlington and Salmon[4] reported ten cases of mucous membrane involvement. Eight patients had died (1937), and in two cases there was no record. One case involved the tongue, two the palate and seven the gingivae. The symptoms were looseness of the teeth, a "mouse-eaten" ulceration of the mucous membrane and pain. There was a short pulmonary history and a high incidence of tuberculous ulceration of the larynx. They thought that these lesions arose by blood stream infection plus direct and lymphatic extension.

Martin and Koepf[5] reported five cases, four of which were fatal. All of the patients had pulmonary tuberculosis. Three cases showed a deep-seated ulceration involving the maxillary process and extending into the antrum. One case presented an extensive indurated lesion resembling carcinoma.

The other case was of the superficial type of ulceration usually noted in oral tuberculosis. Two of these patients had repeatedly negative sputum. This fact raised the question as to whether tubercle bacilli might not have originally been conveyed to the site of infection by the blood stream. In these patients, pain was not a frequent symptom.

Stahler[6] collected from the literature thirty cases of solitary or primary tuberculosis of the lip. Most of the cases were in males. He believed that "labial tuberculosis is not necessarily a lesion of advanced tuberculosis or its sequelae."

MacPherson and Gregg[7] reported a chronic undermining lesion of the lower lip in a man, aged 26. The edges were thick and raised and the base was indurated. There was an associated active pulmonary tuberculosis with positive sputum, dental caries and cervical adenitis. Excision was followed by rapid healing.

With the evidence at hand, we are not justified in stating the probable train of events in our patient. However, the following points should be emphasized.

1. The previous medical history was negative and there was no known intimate contact with any person suffering from active pulmonary tuberculosis.

2. The initial symptom was a painless ulcer of the gingiva.

3. There was no history of local trauma.

4. The patient was not subject to aphthous ulceration or herpes labialis.

5. On examination, except for the ulcer, the condition of the teeth, gingivae and oral mucous membrane was good. Dental x-ray examination was negative. X-ray examination of the chest revealed bilateral pulmonary tuberculosis.

6. There were no respiratory symptoms at any time.

7. Death occurred within a month of our first examination.

8. Necropsy revealed tuberculosis of the lungs, brain and mouth. Tubercle bacilli were demonstrated by smear and culture in the brain. The scarring and caseation noted in the lung suggest that the lung lesion antedated the oral lesion.

SUMMARY

In a case of oral tuberculosis, terminating fatally with tuberculous meningitis, the clinical course was short (three months). There was an associated pulmonary tuberculosis. The oral lesion probably arose from implantation of tubercle bacilli from the lungs.

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SILICATE CEMENT: AN INVESTIGATION BY A GROUP OF PRACTICING DENTISTS UNDER THE DIRECTION OF THE A.D.A. RESEARCH FELLOWSHIP AT THE NATIONAL BUREAU OF STANDARDS*

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PURPOSE

ONE of the principal features of the cooperative research program on dental materials of the Research Commission of the American Dental Association and the National Bureau of Standards is the work with the cooperating committees of dentists. This work was made a major item of the program because it was realized that if the investigations of the laboratory workers at the National Bureau of Standards were to be made effective, it would be necessary to harmonize and interpret laboratory and clinical findings. The results of this type of correlation in the inlay casting process[1] and in the investigation of the zinc phosphate cements[2] have been published in earlier reports.

Following the completion of the silicate cement investigation, a series of fourteen experiments was prepared. Uniform samples of each manufacturer's product were furnished by the Research Commission. Results of these experiments reveal (1) the physical and chemical behavior of different brands of cements and (2) the effect of the method of manipulation upon the usefulness of the cements.

R. H. Volland, Iowa City, Iowa, served as the chairman of the committee of 115 practicing dentists who conducted the experiments. In each region where there was a group of cooperating dentists, one member served as a contact man, and through him all details were handled.

QUESTIONNAIRE

Pertinent information concerning the use of silicate cement can best be obtained from dentists by the questionnaire method. To know what cements are preferred, what properties dentists consider significant from a clinical viewpoint and what manipulative procedures they are using is of material aid in preparing a silicate cement specification. Accordingly,

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the following questionnaire was sent to all members of the group when the laboratory investigation[8] was begun.

Name of contact man_____
Name of cooperator_____

1. What brand of cement are you now using?

2. Why are you using this particular brand? (Mixes smoothly, satisfactory clinically, sets rapidly, sets slowly, adhesive, fine grained, strong, insoluble, no expansion, no contraction, hydraulic, opacity, color, price.) Underscore reasons.

Other reasons:

3. How many years of service do you usually obtain from this cement?

4. How long have you used it?

5. How many bottles do you use a year?

6. What complaints have you in regard to the cement you are now using, or have used recently?

7. What cements (that you have worked with) do you consider unsatisfactory?

What are the objections?

8. What properties do you think are most important in a silicate cement of this type? (List the properties in the order of their importance by placing numbers before them.) Crushing strength, hydraulicity, fineness of powder, acidity of completed mix, insolubility, color, time of setting, change in dimension on setting, adhesiveness, temperature rise on setting, permeability, plasticity, density of powder, opacity, density of mixed cement, hardness. Name any other properties that you consider important.

9. Have you ever attempted to make comparative clinical or laboratory tests on silicate cements? If so, what were they?

10. Is your mixing technic standardized or reproducible? If so, give all of the information on it that you can, including the amount of powder and liquid used_____, the temperature of the slab_____, time of mix_____.

11. Do you believe that the silicate cements are more irritant to the pulp than are other restorative materials?

12. In what types of restorations are the silicate cements definitely contraindicated?

Other comments_____

Question 1. The replies to Question 1 of the questionnaire, which are listed in Table 1, indicate the choice of trade brands among the cooperating dentists. It will be noted that 80 per cent of the cooperators were using De Trey's or S. S. White's cement. This is significant because the composition and physical properties of the two cements are in general very similar.

TABLE 1.—COOPERATORS' REPLIES TO QUESTION 1 OF QUESTIONNAIRE SHOWING PREFERENCE FOR SILICATE CEMENTS

Brand of Cement	Manufacturer or Distributor	Users Per Cent
Astralit	Premier Dental Products Co.	0.8
Certified Enamel	Lee S. Smith & Son Mfg. Co.	3.2
De Trey's Synthetic Porcelain	The L. D. Caulk Co.	44.8
Durenamel*	Baker & Co., Inc.	1.6
Durodent Enamel	Oskar Schaefer	4.8
Enamodent	Enamodent Laboratories, Inc.	1.6
Filling Porcelain	The S. S. White Dental Mfg. Co.	35.2
Plastic Filling Porcelain	Baker & Co., Inc.	8.0

*Not made at the present time under this brand name.

Question 2. The reason cited by the cooperators for using the particular brands in their practices is chiefly that the cement was satisfactory clinically; i.e., for silicate cements.

Question 3. The average life expectancy of a silicate cement filling, according to the replies to Question 3, is approximately 4½ years. Many of the cooperators qualified their replies by stating that the length of service depended on the mouth in which the filling was placed. In some mouths, the fillings would not last longer than six months,

while in other mouths they might last a quarter of a century or longer.

Question 4. Nine years was the average time that the cooperators had been using the particular choice of silicate cement.

Question 5. Approximately 72 per cent of the cooperators estimated the number of bottles of powder used annually in their practices. The average was seven and one-half bottles. As about 0.6 gm. of powder is used in the average mix and as a bottle of powder contains 15 gm., it can be seen that approximately twenty-five mixes, that is twenty-five restorations, can be made with each bottle of powder. As there are roughly 60,000 dentists in this country, this would mean that nearly 11,000,000 silicate cement restorations are made yearly, an approximate average of 190 silicate cement fillings per year per dentist. It is realized that the foregoing figures are rough estimates.

TABLE 2.—COOPERATORS' RESULTS ON EXPERIMENT 1: ANALYSIS OF MIXING TECHNIC

Brand of Cement	Amount of Powder Used in 0.2 Ml. of Liquid
	Average Gm.
Berylite (Ames)	0.69
Certified Enamel (Smith)	0.69
De Trey's Synthetic Porcelain (Caulk)	0.72
Durenamel (Baker)	0.78
Durodent Enamel (Schaefer)	0.76
Enamodent (Enamodent Laboratories, Inc.)	0.61
Filling Porcelain (S. S. White)	0.71
Plastic Filling Porcelain (Baker)	0.70

Question 6. The four most prominent causes of the failure of silicate cement in service are, according to the cooperators' observations, solubility, discoloration, low strength and shrinkage. It is evident that any major improvement in the development of more satisfactory cements must decrease the solubility, discoloration and shrinkage and increase the toughness without impairing important properties, such as proper setting time, color and opacity. There undoubtedly will be definite improvement in some of these qualities, but the major advancement in the serviceability of silicate cements will be in the dentists' technic. Thus, if a dentist makes a mix of cement that contains a relatively large amount of powder in a given amount of liquid, the mix will be less soluble, will be stronger, will shrink less and will discolor less than a mix made from a lower powder-liquid ratio. Thus, the satisfactory use of these cements is to a large extent in the hands of the operator.

Question 7. That all of the silicate cements in current use are considered to be imperfect is evidenced by the replies, all of the brands being mentioned as unsatisfactory in that silicate cement cannot be considered as a permanent filling material.

Question 8. In order of importance, the cooperators listed desirable properties of silicate cements as: insolubility, satisfactory optical properties, change in dimension on setting, etc.

Question 9. A few of the cooperators had conducted comparative clinical tests on silicate cement, but no one reported that any single cement was exceptional as far as permanency of form and of color were concerned.

Question 10. Because of the great influence of the mixing technic upon the properties of a cement, the replies to Question 10 have a special significance. Seventeen cooperators were proportioning the powder and liquid, as is generally customary; the others were placing an excess of powder on one end of the slab and then gradually adding the powder to 2 or 3 drops of liquid until a more or less putty-like consistency was obtained. The average slab temperature was about 68° F., and the average mixing time one minute and eight seconds. These values indicate that, in general, the manufacturer's

directions for mixing the cements were being used.

Question 11. For years, there has existed a decided difference in professional opinion as to whether the silicate cements are more irritant to pulp tissue than are other types of dental cements or filling materials. The replies to Question 11 show the present confusion in this matter. Of the 106 cooperators who replied to this question, forty-nine believed that silicate cement is more irritating, forty-eight thought it is not and nine were undecided.

Question 12. The almost universal conclusion that silicate cement, because of its inherent properties, is unsuitable for all fillings except Class III, Class V and perhaps small Class I fillings is apparent from the replies to Question 12.

EXPERIMENTS

The fourteen simple laboratory experiments which the committee of cooperating dentists performed in their offices have been briefed. These reports, together with the tabulated results of their experimentation, follow. The apparatus used in conducting the experiments was practically the same as that described in another report.[2]

Experiment 1: Analysis of Mixing Technic.—Part of a weighed amount of powder was mixed with 0.2 ml. of liquid by the cooperating dentist until the consistency which he customarily used for filling was reached. As the original amount of powder was in excess, not all of it could be combined with the liquid. The difference between the weight of the original amount of powder and the weight of the unused portion was the amount that the cooperating dentist used in 0.2 ml. of liquid to obtain the desired consistency for filling.

The dentists also supplied details of their mixing technics, such as time of mixing and temperature of mixing slab.

Results of the analysis of mixing technics: The analysis of the mixing technic employed by each cooperator is important because of the effect that the mixing

TABLE 3.—COOPERATORS' DATA ON EXPERIMENTS 2 AND 3: TIME OF SETTING, STAINING CHARACTERISTICS AND HARDNESS OF SILICATE CEMENTS

Brand of Cement	Setting Time* Average Minutes	Staining at Room Temperature				Hardness at Room Temperature	
		Buffalo Black Dye		Methyl Violet Dye			
		A† and B	C and D	A† and B	C and D	A# and B	C and D
		Percentage‡		Percentage‡		Percentage‡	
Berylite (Ames)	2	92	8	91	9	64	36
Certified Enamel (Smith)	2½	90	11	45	55	39	61
De Trey's Synthetic Porcelain (Caulk)	3	61	39	76	24	44	55
Durodent Enamel (Schaefer)	6	62	38	53	47	48	54
Enamodent (Enamodent Laboratories, Inc.)	5	55	44	71	28	64	37
Filling Porcelain (S. S. White)	3	77	24	49	51	58	42
Plastic Filling Porcelain (Baker)	6	46	54	48	52	25	75

*In this and the following tables, the setting times of some of the cements are given to the nearest one half minute when so reported by the cooperators.

†A, least staining; D, most staining.

#A, hardest; D, least hard.

‡Computed on the number of replies received on each cement.

technic has upon the physical properties, and therefore upon the serviceableness of the cement. For instance, if one cooperator used 1.00 gm. of powder in 0.2 ml. of liquid, and another used only 0.45 gm. of the same powder, there was a vast difference in the quality of two fillings prepared from these mixes. The thick mix (1 gm. of powder to 0.2 ml. of liquid) will set quicker, be stronger and far less soluble and shrink far less than the thin mix (0.45 gm. of powder to 0.2 ml. of liquid). This was shown quantitatively in another report.[3]

The average amounts of powder of the various brands of cements used by the cooperators in 0.2 ml. of liquid are shown in Table 2.

stance cannot be much below room temperature without precipitation of moisture on the slab. It will be impossible under these conditions to make so desirable a mix as could be made on a cold dry day. Undoubtedly, better silicate cement restorations are made in winter because of this fact. However, the cooperators throughout the country were in general uniform in their mixing technic, as is shown by the low deviations from the average values. As a typical example, the average deviation of De Trey's synthetic porcelain was ±0.04 gm. of powder from the average of 0.72 gm. of powder in 0.2 ml. of liquid.

The average temperature of the slabs upon which the mixes were made was

TABLE 4.—COOPERATORS' DATA ON EXPERIMENT 4: EFFECT OF VARYING POWDER: LIQUID RATIO ON SETTING TIME

Brand of Cement	Normal Mix	Reduced (Thin) Mix	Increased (Thick) Mix
	Average Setting Time Minutes	Average Setting Time Minutes	Average Setting Time Minutes
Certified Enamel (Smith)	3	5	3
De Trey's Synthetic Porcelain (Caulk)	4½	15½	4
Durodent Enamel (Schaefer)	6½	13½	4½
Enamodent (Enamodent Laboratories, Inc.)	8	25	3
Filling Porcelain (S. S. White)	4	6	3½
Plastic Filling Porcelain (Baker)	5	11½	4½

Of course, it is possible to overload the liquid with powder, and in this connection it should be noted that only under favorable circumstances of temperature and humidity can 1.00 gm. of powder be incorporated in 0.2 ml. of liquid. A slab temperature of from 55 to 60° F. is needed to do this, but one cannot always obtain such a low temperature without condensation of water on the slab. The temperature of the mixing slab must be above the dew point. On a hot humid day, the temperature of the room may be near the dew point. The temperature of the mixing slab in this in-

70° F. The extremes of the high and low temperatures employed were 80° F. and 52° F., respectively.

The average mixing time was slightly more than a minute (sixty-eight seconds). Some cooperators mixed as long as 140 seconds, whereas others completed the mix in thirty seconds. A long mixing time is very injurious because the colloidal matrix material, which is formed by the chemical reaction between the powder and the liquid, is broken up during the prolonged mixing. This colloidal matrix when once broken does not reunite. Consequently, a long mixing time

causes the cement to set more slowly and to be weaker. The minimum time necessary to wet the powder with the liquid is the ideal mixing time. If this can be accomplished in thirty seconds, so much the better.

The mixing technic employed in producing test specimens for the silicate cement investigation was based upon the average values for consistency of mix, ical reaction of the cement mix could be prevented until the mix was placed in the cavity, so that the colloidal matrix material could be formed undisturbed, a better restoration would be produced than is usual.

Experiment 2: Setting Time and Hardness at Room Temperature, and Staining with Dyes.—The time of setting of the various cements was determined at room

TABLE 5.—COOPERATORS' DATA ON EXPERIMENT 4: EFFECT OF VARYING POWDER: LIQUID RATIO ON STAINING

Stain	Number of Dentists Reporting					
	Least Staining			Most Staining		
	Thin Mix	Normal Mix	Thick Mix	Thin Mix	Normal Mix	Thick Mix
Buffalo black	19	46	54	47	6	12
Methyl violet	8	34	41	55	10	22

TABLE 6.—COOPERATORS' DATA ON EXPERIMENT 5: EFFECT OF VARYING THE MIXING TIME ON SETTING TIME AT ROOM TEMPERATURE

Brand of Cement	Time of Mixing		
	One-Half Normal	Normal	Twice Normal
	Average Setting Time		
	Minutes	Minutes	Minutes
Certified Enamel (Smith)	2½	3	4½
De Trey's Synthetic Porcelain (Caulk)	4½	4½	6
Durodent Enamel (Schaefer)	5	6½	8
Enamodent (Enamodent Laboratories, Inc.)	4½	8	8
Filling Porcelain (S. S. White)	4	4	5½
Plastic Filling Porcelain (Baker)	5	5	11½

time of mixing and slab temperature which the cooperators were using.

The whole mixing technic should be designed to incorporate as much powder in the liquid as is possible and yet have a workable mass.[4] This can be achieved by: 1. Use of a chilled mixing slab, which delays the reaction between the powder and liquid. 2. A short mixing time, which lessens the time the unset mass is allowed to react on the slab. If the chem- temperature with a Gillmore needle and a stopwatch. The setting times were reported to the nearest minute. The specimens used in the determination of setting time were immersed for one week in two types of dye solutions; namely, acid (buffalo black) and alkaline (methyl violet) reacting types. The ends of the specimens were then ground off so that the depth and degree of penetration of the dyes could be noted. The cooperators rated

the specimens A, B, C, etc.; A indicating the least staining (Table 3).

The relative hardness was ascertained by scratching the specimens with an exploring point. Arbitrary ratings of A, B, C, etc., were used to designate the comparative hardness, A being the hardest (Table 3).

Experiment 3: Setting Time at Mouth Temperature and Humidity, and Staining with Dyes.—Experiment 2 was repeated, with mouth instead of room temperature (Table 3).

DISCUSSION

The setting time at mouth temperature is shorter in every case than at room temperature because the chemical action between the powder and liquid proceeds faster at the higher temperature. In using the cements practically, one can be certain that if the cement has set at room temperature, it is safe to remove the celluloid strip and to coat the filling with varnish.

It must be remembered that the setting time is measured from the beginning of the mix to the initial hardening point. Therefore, the minimum time of setting should not be less than three minutes as this allows one minute for mixing, one minute for placing in the cavity and one minute for hardening.

As silicate cements are slightly acid in reaction, the acid-reacting dye, buffalo black, did not stain the cements as heavily as did the alkaline-reacting dye, methyl violet.

The hardness rating, even though determined by a crude method, was relatively good. The tests for staining and hardness were conducted at room temperature.

Experiment 4: the Effect of Powder-Liquid Ratio on the Setting Time and Staining.—The setting time and the staining characteristics of thin, normal and thick mixes were determined.

The results of the cooperators' findings for Experiment 4 are given in Tables 4 and 5. The data in Table 4 show that the setting time of the thin mixes is usually too long. In most instances, it was longer than the eight minute maximum permitted by A.D.A. Specification No. 9 for Dental Silicate Cement. For the normal and thick mixes, the average setting time was within the range (minimum of three minutes to a maximum of eight minutes) of the A.D.A. Specification requirement.

The data in Table 5 show that thin mixes stain more deeply than the normal or thick mixes.

Experiment 5: Effect of Mixing Time on Setting Time.—Twice the normal

TABLE 7.—COOPERATORS' DATA ON EXPERIMENT 6: EFFECT OF THE RATE OF INCORPORATING POWDER ON SETTING TIME

Brand of Cement	Rate of Adding Powder	
	Six Equal Portions at Ten-Second Intervals	All at Once
	Average Time of Setting	
	Minutes	Minutes
Certified Enamel (Smith)	2½	2½
De Trey's Synthetic Porcelain (Caulk)	4	4
Durodent Enamel (Schaefer)	7½	6½
Enamodent (Enamodent Laboratories, Inc.)	7	6½
Filling Porcelain (S. S. White)	4½	4
Plastic Filling Porcelain (Baker)	4½	4

mixing time and one-half the normal mixing time were used in this experiment to demonstrate the effect on the time of setting of varying the mixing time.

According to the data on Experiment 5 (Table 6), when the normal mixing time of one minute was doubled, the time of setting was, with one exception, increased. When the normal mixing time was halved, the time of setting was reduced or was not affected.

Experiment 6: Effect of the Rate of Incorporating the Powder on Setting Time.—In addition to the normal method of adding the powder to the liquid, two modifications were used: (1) the powder was added in six equal portions at ten-second intervals and (2) the powder was added all at once.

According to the data on Experiment 6 (Table 7), the time of setting was usually slightly reduced when the powder was added all at once instead of in six equal portions at ten-second intervals.

Experiment 7: Effect on Setting Time of Exposing Cement Liquid to Air.—The cement liquids were left on the mixing slab overnight. The mix was then completed the following morning and the time of setting determined. Most of these experiments were conducted in winter.

The data on Experiment 7 (Table 8) show that exposing the liquid to air over a long period results in an extremely slow-setting cement. These data can be varied considerably because the humidity of the air in the room where the liquids are exposed governs the amount of water that is taken or given up by the liquids. The water content of the liquids has a critical effect on the setting time. In summer, when the humidity is often high, the cement liquids will usually gain water, and a fast-setting cement will result. In winter, the liquids lose water because of the low indoor humidity, a slow-setting cement resulting. The cement liquid may be in equilibrium with the humidity of the air; in which instance, there would be no change in the water content of the liquid and hence no change in the time of setting.

TABLE 8.—COOPERATORS' DATA ON EXPERIMENT 7: EFFECT ON SETTING TIME OF EXPOSING CEMENT LIQUID TO AIR

Brand of Cement	Average Time of Setting	
	Cement Mixed with Normal Liquid	Cement Mixed with Liquid Exposed to Air for Twenty-Four Hours
	Minutes	
Berylite (Ames)	3	More than 15 hours
Certified Enamel (Smith)	3½	28 minutes
De Trey's Synthetic Porcelain (Caulk)	6	More than 15 hours
Durodent Enamel (Schaefer)	7	More than 10 hours
Enamodent (Enamodent Laboratories, Inc.)	7	More than 7 hours
Filling Porcelain (S. S. White)	5	More than 5 hours
Plastic Filling Porcelain (Baker)	7	More than 6 hours

Experiment 8: Effect of Temperature on Setting Time.—Mixes were made on slabs held at two temperatures; namely, 85 and 99° F. The time of setting was measured under the same environment.

According to the data for Experiment 8 (Table 9) in every case but one, the setting time was shorter when the cement was mixed on the hotter slab. The cement mixing slab should always be cooled so that the action between the powder and liquid will proceed at a relatively

slow rate. This will permit the incorporation of a greater amount of powder without increasing the consistency of the mix.

Experiment 9: Staining of Silicate Cements with Dyes, Including "The Mercurochrome Test."—The middle section of a glass tube was plugged with silicate cement and the rest of the tube filled with a dye solution. If the dye solution penetrated between the inside wall of the tube and the cement plug, the cement was said to shrink. If the dye did not pass between the tube and the cement plug, the cement was said to have expanded. Methyl violet, buffalo black and mercurochrome were the dyes used. Mercurochrome is not an appropriate dye for these tests because it reacts chemically with the cement. A gelatinous red precipitate is formed when a few drops of silicate cement liquid is added to a mercurochrome solution.

TABLE 9.—COOPERATOR'S RESULTS ON EXPERIMENT 8: EFFECT OF TEMPERATURE ON SETTING TIME

Brand of Cement	Average Time of Setting (Minutes)	
	Slab at 85°F.	Slab at 99°F.
Berylite (Ames)	1½	1
Certified Enamel (Smith)	3	3
De Trey's Synthetic Porcelain (Caulk)	3½	2½
Durodent Enamel (Schaefer)	9	5½
Enamodent (Enamodent Laboratories, Inc.)	5½	4½
Filling Porcelain (S. S. White)	3½	2½
Plastic Filling Porcelain (Baker)	4½	3½

The results for Experiment 9 on buffalo black and methyl violet are given in Table 10. The top and bottom surfaces of the cement plugs were stained in every instance, but, in the case of slow-setting cement, the cooperators reported that the dyes did not penetrate rapidly between the glass tube and cement plug. This was probably caused by a surface expansion which occurred when the slow-setting cements came in contact with water. When alcoholic solutions of the dyes were used, rapid penetration took place between tube and plug.

Experiment 10: Opacity.—The relative opacity of cement disks (1 mm. thick) were determined by placing the disks, covered with water, over a variegated black and white background and by observing the appearance of the black and white design through the cement specimens. The cement through which the black and white pattern is most distinct is the least opaque. The cements were arbitrarily graded A, B, C, etc., A being the least opaque.

The data on opacity are shown in Table 11. Among the cements, it will be noted that there is a considerable difference in opacity. Cements having an intermediate value for opacity are desirable. Since the publication of the A.D.A. opacity standards,[8] many of the cements that the cooperators tested have been so changed that the opacity of the cements is now not greatly different from that of the teeth.

Experiment 11: Effect of Premature Exposure to Water.—Disks of cement were prepared in such a manner that one-half of the area of each side of the disks was protected by cellophane. The disks were then submerged in water one minute prior to the initial set of the cement. One-half hour later, the cellophane coating was removed. After twenty-four hours of immersion, the difference in appearance of the two areas on the disks was noted.

The cooperators invariably reported that the cement areas that were prematurely exposed to water had a soft, porous and opaque surface layer, while the surface protected from the water for one-half hour was normal in appearance. The slow-setting cements were affected the most.

No silicate cement should be exposed to water or saliva until at least a half hour after the initial set has taken place. It should be protected by a varnish or wax immediately after the matrix is removed. Saliva may then be allowed to cover the filling.

Experiment 12: Effect of Contact with Air During Initial Hardening.—One end of a small cylinder of cement was protected from the air during setting, while the other end was exposed. The difference in appearance of the ends was observed after a half hour.

Most of the cooperators reported that the end of the specimen which was protected from air had a highly glazed appearance and was smoother than the surface which was exposed to air. The end of the specimen exposed to the air was slightly softer than the unexposed end.

The cement filling should always be protected from air by a varnish or wax coating immediately after removal of the celluloid strip.

Experiment 13: Solubility.—A disk of cement, of the type used in Experiment 10, was powdered. This powdered cement was added to 15 ml. of water and allowed to remain overnight. A drop of the clear liquid lying above the powdered cement was placed upon a clean glass plate and carefully evaporated over a bunsen flame until only a residue remained. This experiment was repeated on each cement. The relative opacity of each residue gives a rough measure of the relative solubility of the cements.

The results of the cooperators' findings for Experiment 13 are tabulated in Table 12. Here, it will be noted that the slow-setting cements (Table 3) appear to be the most soluble.

Experiment 14: Acidity.—The relative acidity of the liquids used in Experiment 13 was roughly determined by using a solution of the indicator dye, methyl red. Ten drops of methyl red was added to 3 ml. of liquid containing the soluble portion of the cement under test. The resulting solutions were then arranged in the color order, yellow, orange and red. The yellow tints indicated lower acidity than the orange and red shades. The yellowest of the solutions was given an A rating; that is, least acid. A D rating was the most acid; that is, the reddest solution.

The cooperators' results (Table 13) show that the washings of some of the cements were more acid than others.

TABLE 10.—COOPERATORS' DATA ON EXPERIMENT 9: STAINING OF SILICATE CEMENT WITH DYES

Brand of Cement	Relative Degree of Staining* with					
	Aqueous Solution of				Alcoholic Solution of	
	Methyl Violet		Buffalo Black		Methyl Violet	
	A* and B	C and D	A and B	C and D	A and B	C and D
	Percentage†		Percentage†		Percentage†	
Berylite (Ames)	50	49	7	93	20	80
Certified Enamel (Smith)	19	81	34	66	54	46
De Trey's Synthetic Porcelain (Caulk)	25	74	27	73	38	62
Durodent Enamel (Schaefer)	53	48	34	65	71	30
Enamodent (Enamodent Laboratories, Inc.)	16	84	22	78	37	63
Filling Porcelain (S. S. White)	43	57	25	75	63	37
Plastic Filling Porcelain (Baker)	42	58	42	58	47	53

*A, least staining; D, most staining.

†Computed on the number of replies received on each cement.

In most cases, the slow-setting cements (Table 3) were more acid than the rapid-setting ones.

SUMMARY AND CONCLUSIONS

1. A cooperating committee of 115 dentists answered a questionnaire and performed a series of fourteen experiments on several trade brands of silicate cements.

TABLE 11.—COOPERATORS' DATA ON EXPERIMENT 10: RELATIVE OPACITY

Brand of Cement	Relative Opacity*	
	A and B	C and D
	Percentage†	
Berylite (Ames)	11	89
Certified Enamel (Smith)	27	73
De Trey's Synthetic Porcelain (Caulk)	67	32
Durodent Enamel (Schäefer)	43	57
Enamodent (Enamodent Laboratories, Inc.)	50	50
Filling Porcelain (S. S. White)	70	30
Plastic Filling Porcelain (Baker)	44	55

*A and B, least opaque; C and D, most opaque.
†Computed on the number of replies received on each cement.

TABLE 12.—COOPERATORS' DATA ON EXPERIMENT 13: RELATIVE SOLUBILITY

Brand of Cement	Relative Solubility*	
	A and B	C and D
	Percentage†	
Berylite (Ames)	62	39
Certified Enamel (Smith)	76	24
De Trey's Synthetic Porcelain (Caulk)	72	28
Durodent Enamel (Schaefer)	45	55
Enamodent (Enamodent Laboratories, Inc.)	9	91
Filling Porcelain (S. S. White)	83	16
Plastic Filling Porcelain (Baker)	42	58

*A and B, least soluble; C and D, most soluble.
†Computed on the number of replies received on each cement.

2. The average life expectancy of a silicate cement filling was estimated to be about 4½ years.

3. It has been estimated, from the average annual consumption of silicate cement powder by the cooperating dentists, that approximately 11,000,000 silicate cement fillings are placed annually. This amounts to roughly 190 silicate fillings per year per dentist.

4. The failure of silicate cement restorations can be primarily attributed to high solubility, discoloration, low strength and shrinkage.

5. Opinions of the cooperators as to whether silicate cement is more irritant to the pulp than other filling materials were about equally divided.

TABLE 13—COOPERATORS' DATA ON EXPERIMENT 14: ACIDITY

Brand of Cement	Relative Acidity*	
	A and B	C and D
	Percentage†	
Berylite (Ames)	25	75
Certified Enamel (Smith)	68	31
De Trey's Synthetic Porcelain (Caulk)	35	66
Durodent Enamel (Schaefer)	5	95
Enamodent (Enamodent Laboratories, Inc.)	41	59
Filling Porcelain (S. S. White)	68	32
Plastic Filling Porcelain (Baker)	31	78

*A and B, least acid; C and D, most acid.
†Computed on the number of replies received on each cement.

6. Silicate cement is not suitable for restorations which must sustain biting or chewing forces. In fact, no dental cement available can be so used.

7. Analysis of the cooperators' mixing technics revealed a great variance in the powder-liquid ratios employed. This means that great differences exist in the properties of the fillings. The mixes containing the smaller amounts of powder are very inferior.

8. Reducing the quantity of powder in

a mix increased the setting time of the cement. Specimens prepared from such mixes also stained more than those prepared from mixes containing a normal amount of powder. The staining was less when the amount of powder used in a mix was more than usual. The advantages of thick mixes indicate therefore that the dentist should use the maximum amount of powder possible for the case at hand.

9. The average time of mixing of the cooperators was slightly more than one minute. When two minutes was used, the time of setting of the resultant mix was, with one exception, increased over the normal setting time. If the cement was mixed for only thirty seconds, the time of setting was reduced or was not affected.

10. The time of setting was usually slightly reduced when the powder was added all at one time instead of in six equal portions at ten second intervals.

11. The water content of the cement liquid is critical. If the liquid was exposed to air overnight and then mixed with the normal amount of powder, the cement would not harden for many hours. In an extremely damp climate, the reverse is true.

12. Increasing the temperature of the mixing slab decreased the time of setting in nearly every case. The cool slab is of great advantage because more powder can be used in the mix.

13. All of the silicate cements were stained by dye solutions. The alkaline-reacting dyes stained the deepest. Mercurochrome is not suitable for use in the so-called mercurochrome test, because it is precipitated by the cement liquids.

14. The opacity of silicate cements varied over a wide range. Some were evidently too opaque, others too translucent to harmonize well with tooth tissues.

15. All of the cements, especially the slow-setting, were severely damaged when exposed to water just prior to the initial time of setting. The surface hardness and translucency of the cements were materially lessened.

16. A silicate cement filling should not be exposed to air during hardening. The surface exposed to air is rougher and slightly softer than the protected surface.

17. The solubility of the slow-setting cements is greater than that of the rapid-setting ones. (Tables 3 and 12).

18. The acidity of solutions of cements, made by soaking powdered cement in water, was found to vary with the cement. In general, the solutions of the slow-setting cements were more acid. (Tables 3 and 13).

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DENTAL HEALTH EDUCATION NEEDS

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THE needs for dental education are so great and the groups to be educated so varied that it is impossible to do justice to the subject in one short paper.

The ultimate object of dental education is, of course, to enable our citizens to prevent dental disease. "Education exists," says Everett Dean Martin, "in order that all men may have the opportunity to attain their maximum intellectual maturity, to outgrow their infantile and adolescent ideas and emotions and to assume the full responsibility of adulthood."

Dentistry believes that it has a definite contribution to make to the welfare of mankind. We know, far better than any one else, America's dental problem. We know the prevalence of dental disease; we know its effect upon health, efficiency and the economic status. We do not know its cause, but we do know methods by which much of it can be prevented. It is our duty to make these facts known. We must use every avenue of approach, and every means at our disposal. The problem of preventive dentistry is too great to be solved by dentists alone. We need the cooperation and assistance of all other professions who influence the public for the common good.

Never before in the history of dentistry has the need for preventive dental education been so great as at present. The pioneer work done by Ebersole, Fones, Johnson, Hyatt and others succeeded in inspiring a handful of followers. Today, after twenty years, this small group can look back with some degree of satisfaction on the progress made. However, dental educators are as yet far from their goal. They have not, to borrow a phrase from the World War, gone over the top. At the present time, they are recruiting reserves, gathering ammunition and making a few sorties. True, in certain sectors, some ground has been gained, and the public is slowly recognizing that dentistry exists, but, on the entire battle front, dental education or preventive dentistry has not broken through the barbed-wire entanglements of ignorance, inertia and indifference, behind which the enemy is entrenched. Certainly, the need for more and better educational material is great and the wants of the dental educator are varied.

It is impossible here to cover all of our needs, but I do wish to emphasize the fact that if we are to successfully educate and help the public, we must direct more educational ammunition into the ranks of our own profession and into the ranks of other professional groups. The average dentist, physician, public health administrator, nurse, educator or editor knows little about preventive dentistry and therefore cares little about it. One of our greatest needs is to educate him. Only through education can the members of these professions be enlisted in our service.

An inexcusably large number of dentists are complacently unaware of the importance of preventive dentistry and the value of dental education. They know that children's teeth should be

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cared for. They know that the public should be better educated in dental matters. But mere knowledge is not enough: Knowledge must be so profound that it will motivate one to action. One of our fundamental needs then is to broaden our own education—broaden it so greatly that we shall not only know, but shall also act. Dental schools and dental societies must assume stronger leadership in this movement. True, within recent years, most dental schools have developed children's departments; but teaching students operative technic is not sufficient. The instruction should be so complete and so thorough that every graduating dentist will regard preventive dentistry as an incontrovertible law—just as the graduate engineer recognizes certain basic construction laws and the graduate physician recognizes the fundamental laws of vaccination and immunization. In short, dental students must be thoroughly inoculated with the spirit of preventive dentistry, not simply exposed to it.

Dental societies are to be congratulated on their recent activities regarding refresher and study courses in children's dentistry given in cooperation with state health departments. These courses should be continued, improved and repeated just as often as time and money will permit. One refresher course is not enough: education is acquired by repetition. Adults, even more than children, must be exposed over and over again before the lesson is learned.

Dental societies need educating. A clearer understanding of the ethics involved in disseminating dental education is important. All too frequently, an alert, enthusiastic dentist attempts to do some educational work in the local schools only to find that he has incurred the displeasure of the local dental society. He is accused of self-advertising and self-promotion and is told that all dental education must be conducted by the society itself. In some instances, the society has no public relations committee. In other instances, the committee does not function. As a result, public education continues to be neglected and the educationally inclined dentist not only loses his enthusiasm, but also feels resentful toward his society. It is realized, of course, that some men do use dental education for ulterior purposes, but dental societies should be prepared to differentiate between the true and the false so that the true advocate of preventive dentistry can be encouraged and the public be benefited.

With the exception of the well-trained obstetrician and the pediatrician, physicians know little or nothing about preventive dentistry. This is not said critically: it is merely a statement of fact.

Medical students are taught little about the teeth and almost nothing about preventive dentistry. Consequently, in searching for diseased tonsils, many medical men overlook a mouthful of infected teeth. Few physicians consider the relationship between a child's dental and his general health. They know, perhaps, that such relationship exists; but, again, knowing is not enough. Dental education and particularly education in preventive dentistry for the physician is badly needed. It is generally realized that the prevention of dental disease is as much a medical as a dental problem. Therefore, medical schools should include a short but intensive course on this subject. Physicians should be so inoculated with the value of preventive dental care that they will prescribe it as readily as they prescribe vaccination or diphtheria inoculation.

Public health administrators are usually physicians. Consequently, they too know little about preventive dentistry. Public health administrators are concerned with many problems: sanitation, water, milk and food inspection, control of contagious disease and many others. It is natural for them to stress that phase

of their work about which they know most or in which they are most interested. As a result, preventive dentistry is either omitted entirely or relegated to a minor position. Only recently has the dental profession been able to influence health administrators to include preventive dentistry in their activities. This is a great step forward, but more education is needed in order that the new dental divisions may function efficiently. As yet, far too many dental division chiefs must battle for funds and personnel, and for recognition. The need for dental education is greatest among public health administrators and other public health workers.

The refresher courses in preventive dentistry recently inaugurated in many states have served a twofold purpose. Not only have they helped educate the dentist, but, by their very existence, they have helped educate the public health worker as well. Dentistry needs the cooperation of public health administrators, and every effort should be made to educate them to the value of preventive dentistry.

Few nurses' training schools offer even a rudimentary course in dental hygiene. The average graduate nurse knows little about the care of the mouth and nearly nothing about preventive dentistry. Yet the nurse is one of the most important workers in the health field. Private and institutional nurses should all be actively interested in mouth hygiene. At present, many nurses know less about the subject than does the patient they serve.

The curriculum of every nurses' training school should include a course in mouth hygiene. Reports from various hospitals indicate that this situation is being remedied, but the improvement is taking place very slowly. One of the most encouraging steps in this direction is the recent appointment by the American Hospital Association of a committee of American and Canadian dentists to formulate plans for dental service and education in hospitals. When perfected, the plans will undoubtedly include recommendations by the American Hospital Association that all nurses' training schools include in their curricula a course in dental prevention.

Public health nurses are but little better prepared in the subject than those on private duty. Within the past ten years, the field of public health nursing has expanded enormously; yet those who enter this field know little about the prevention or care of the most prevalent disease of mankind.

The nurse ranks second perhaps to the teacher as the most important ally that we have in promoting preventive dentistry. The teacher, it has been said repeatedly, is the key person in the teaching of healthful living; yet few teachers are educationally equipped to teach dental hygiene. A comprehensive course on this subject should be included in the curriculum of every teachers' training school in this country. Every young man and woman entering the teaching profession should be thoroughly grounded in the rudiments of dental prevention. Again let me repeat that knowledge in itself is not enough. It must be so profound that it will motivate the teacher to action. The health message left by the physician, dentist, hygienist and nurse on their occasional visit is helpful; but it remains for the educator to instil the lesson by constant repetition.

Mathematics, reading and spelling are not taught by monthly messages, and preventive dentistry cannot be taught that way. Educators should be so thoroughly imbued with the importance of good teeth that they will insist on children attending classes with clean mouths, just as they demand clean faces, clean hands and combed hair.

There must be a closer alliance between the American Dental Association and the National Educational Association, to assure a wider distribution of educational material to both teachers and

pupils and better material for distribution. While the two associations have cooperated to some extent in the past, closer cooperation is essential. At the present time, steps are being taken by the Dental Health Education Committee of the American Dental Association to bring this about through the Department of Health, Physical Education and Recreation of the National Educational Association.

There is one more large and influential group of professional people whose cooperation we need, and who, in turn, need considerable dental educating. This group consists of newspaper editors. Unfortunately, far too many editors, particularly small town editors, view dentistry as a commodity rather than as a health service. It is interesting, although irritating, to note the attiude of some editors toward medical articles as compared to dental articles. Hundreds of editors buy syndicated health columns for their readers, yet they will not print a dental health article because they feel that it advertises the dentist. Of course, this statement does not apply to the entire field of journalism, as most papers will print dental articles if they are well prepared.

For the past fifteen months, the American Dental Association has released a monthly news story to about 2,000 newspapers throughout the country. The manner in which these releases have been accepted and used by most papers is very gratifying. During the past twelve months, these stories have appeared in all forty-eight states and in 3,379 towns. The total lineage secured was 2,175,571, reaching a circulation of 53,428,671. These statistics indicate the cooperative spirit manifested by most editors. However, enough letters of protest are received to warrant the assumption that far too many editors view dental service in the same light as merchandise. Newspaper columns are the only educational medium known to thousands of people. The power of the press to mold public opinion is enormous. Therefore, the need is great to educate all editors so that they in turn can help educate their readers to properly evaluate preventive dentistry. When editors are unable to differentiate between education and advertising and refuse to print dental news or dental health copy on the grounds that such material is commercial, it is time for organized dentistry to train a few educational guns in their direction.

In conclusion, it should be repeated that the need of educating the public to a realization of the importance of preventive dentistry is greater today than ever before. Great pressure is being brought to bear on state and federal legislative bodies to inaugurate some form of government health service. The leaders in these pressure groups know nothing about preventive dentistry. The members of the technical committees who have formulated and recommended plans for a national health program know very little more. The legislators who will draft the laws and appropriate the moneys are even less informed than the first two groups. Therefore, organized dentistry must use every means possible to educate those in power so that if federal health legislation is enacted, preventive dentistry will be included.

The House of Delegates of the American Dental Association has, on a number of occasions, stated that the proper approach to the dental phase of a public health program is education and preventive dentistry for children. In spite of that fact, there are some who believe that complete dental care for all adults should be written into health legislation. There are others who believe that dental care is so unimportant or so expensive that it should not be included at all. The fact of the matter is that preventive dentistry is so important and so inexpensive that it should be included in every municipal, state and federal health plan. Only through education will this

ideal be attained. Through education, we must change the nation's concept of dental care so that the term preventive dentistry will symbolize the dentistry of the future.

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A CONGENITAL ORAL DEFORMITY AND ITS CORRECTION

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DURING a practice of many years, one may have the opportunity of seeing certain pronounced oral malformations which may be the result of natural or unnatural forces exerted over a period of years and over which the patient has had little or no control. Particularly is this true when the deformities are genetic. Confronted with cases of this type, it is the duty of the dentist to exert all the skill, scientific and technical, which modern dentistry has evolved, to ameliorate and correct the existing conditions and, as far as possible, to bring harmony out of existing disharmony.

REPORT OF CASE

History.—A girl, aged 18 (Fig. 1), presented herself, in October 1937, for consultation and examination. The immediate complaint was intermittent discomfort in the temporomandibular regions.

Visual Examination.—Assiduous clinical and x-ray examinations of the mouth and face revealed the following defects: The external features were decidedly impaired by the oral deformities. The maxilla was underdeveloped, with eleven permanent teeth missing and a deciduous second molar *in situ* on the right side. The mandible, although normal in size, had six permanent teeth missing. (Fig. 2.) These deformities, together with the lack of posterior occlusion and tooth support, caused a sunken-in condition of the cheek area in the maxillary region, extending from the sides of the nose backward. For the same reason, the vertical maxillomandibular dimension was definitely reduced, protrusion of the mandible and curling of the lips resulting. (Fig. 1.)

X-Ray Examination.—The x-ray findings confirmed the clinical examination in that there were no other teeth to erupt. However, it disclosed an unerupted second premolar in the maxilla lying deeply embedded in the alveolar structure, the crown pointing backward and occupying the space formed by the roots of the deciduous molar on the right side. (Fig. 3.) Both the premolar and the deciduous molar were extracted later, because neither had any chance of ever becoming serviceable.

These anomalies definitely affected the patient's personality. For years, she had been attempting to hide and to compensate for these deformities. Although she was intelligent and possessed a fairly good education, her conversation was rather restricted and she could never be encouraged to speak freely. She conversed with the mouth almost closed, the lips parting merely for the necessary enunciation of words. Her smile was also very much restrained, as she feared exposure of the dental defects. Even in amusing situations, no one ever observed in her complete relaxation and merriment. She had developed a definite inferiority complex.

Treatment.—Plaster impressions were taken and casts were made and articulated. The five permanent teeth present in the maxilla consisted of two central incisors, two cuspids and a left second molar. The cuspids and central incisors had drifted, small equal spaces remaining between them, insufficient for the insertion of artificial sub-

Fig. 1.—Appearance of patient before treatment was instituted.

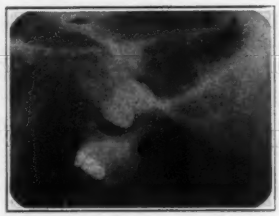

Fig. 3.—Right maxillary deciduous molar with unerupted premolar above it.

stitutes. The left cuspid was rotated linguomesially. The central incisors, which were rather short, appeared as if they had been driven upward into the alveoli for about an eighth of an inch, owing perhaps to the tip-to-tip bite and to the lack of posterior tooth support. Separating the central incisors was a heavy muscular frenum, which later had to be eliminated. The molar, although it had a short crown, was in normal position. All the other teeth, as far as I could learn, were congenitally missing, except for the unerupted second premolar. The next difficulty was presented by a hanging or elongated

Fig. 2.—Anterior and lateral views of casts before treatment; showing drifting of upper and lower teeth, elongated segment of wall of alveolus on upper left side and temporary molar on upper right side.

segment of the wall of the alveolus located between the cuspid and molar area on the left side of the maxilla. The mandible, although of normal development, seemed oversized for the maxilla, with the following teeth missing: right side, first and second bicuspids, first and third molars; left side, first molar. The molar on the right was tipped mesially and the left anterior teeth had drifted distally.

This was a case requiring complete mouth rehabilitation, involving the correction of several major abnormalities: (1) readjustment of the maxillomandibular relation, or closed-bite condition; (2) repositioning of drifted teeth in the maxilla and mandible;

Fig. 4.—Lingual-bar bridge with porcelain jacket cuspid built on metal core and supported by lug.

Fig. 5.—Six unit casting comprising two cuspid metal jackets with provision for baked porcelain veneers, two copings for the central incisors and two metal cores for the reception of lateral porcelain jackets.

(3) removal of a badly impacted and unerupted premolar; (4) removal of an elongated segment of an alveolar wall and a muscular frenum, and (5) substitutions for the missing teeth.

The treatment of this case was divided into three parts: (1) orthodontic, (2) surgical and (3) prosthodontic.

1. Orthodontic: Appliances were constructed simultaneously for the upper and lower teeth for the purpose of alining the drifted and malposed teeth in a more normal position. To facilitate bringing together the central incisors in the maxilla, it was necessary to excise that part of the muscular frenum which extended from the neck of the central incisors labially to the papilla lingually. This was accomplished under local anesthesia by the use of the electric cautery. A previous attempt to remove the frenum by means of pressure atrophy had failed.

After completion of the orthodontic phase of the treatment, and with proper provision to retain the realined teeth in their new positions, my attention was now directed to the surgical phase of the treatment.

2. Surgical: The right second deciduous maxillary molar and the unerupted and malposed premolar were removed. Shortly thereafter, an alveolectomy was performed to remove the elongated segment of the wall of the alveolus in the left maxilla. The healing of the two areas operated upon was rapid and uneventful.

Fig. 6.—Completed anterior maxillary section consisting of four jacket crowns over natural teeth and two jackets supplying lateral incisors supported by metal cores.

Completion of the first two steps of the treatment prepared the field for the third, the most important and also the most difficult phase of the treatment. Everything that had been done was only preparatory to this, the final step. This stage of the treatment was especially important to the patient since it meant the culmination of her hopes and aspirations of many years' standing.

The plan which I had formulated in the very beginning called for the construction of two removable bridges or partial dentures, one for the upper jaw and one for the lower. These partial dentures were to be constructed

with precision attachments for their anchorage to the abutment teeth. The reason for using precision attachments was twofold: 1. The use of any circumferential attachments would involve a display of gold. 2. It was my sincere belief that, with the use of precision attachments, I could assure, over a long period of time (a) a more stimulating and functional activity of the tissues; (b) partial relief from the strain of mastication on the abutment teeth; (c) functioning of the abutment teeth in a more natural manner, and (d) smooth precision fit partial dentures, with esthetic requirements completely met.

partial denture which supplied the missing teeth, built up to the same level or height as the abutment teeth.

The abutment teeth chosen to carry the partial denture were the second right molar and cuspid, and the left first molar. A lug resting on the mesiolingual side of the left cuspid helped to support the denture in that area. The one major difficulty encountered with the lower restoration was the choice of a tooth to fill the space between the left lateral incisor and cuspid. The anterior teeth being rather short, I decided to carry an extension from the lingual bar in the form of a metallic core and build a porcelain jacket,

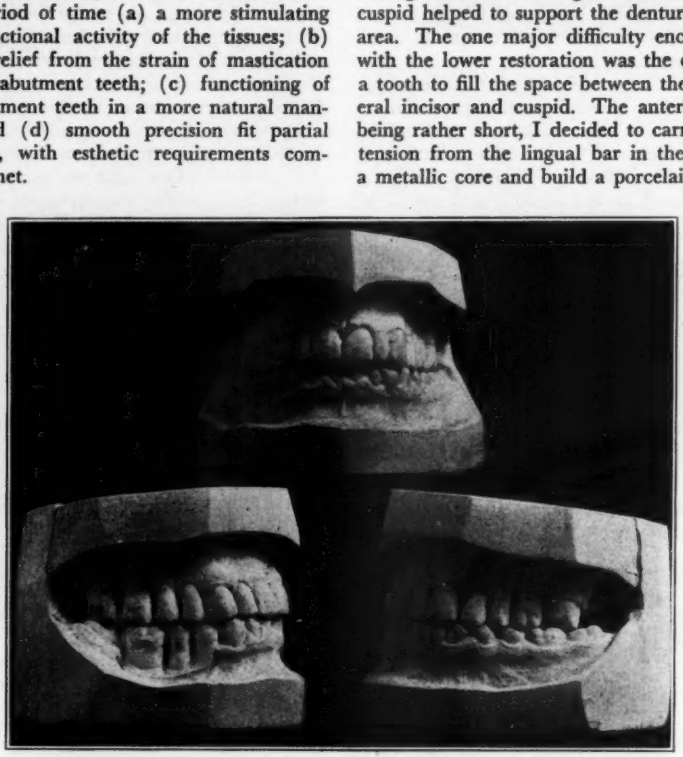

Fig. 7.—Anterior and lateral views of casts after completion of treatment; showing complete mouth rehabilitation.

With this as a goal, I began the third part of the treatment.

3. Prosthodontic: In order to overcome the closed-bite condition, and establish a more normal vertical maxillomandibular dimension, it was necessary to build up several of the lower, and all of the upper teeth. The lower jaw was restored first. This involved building up the abutment teeth with gold inlays or onlays to a plane which opened the bite about 50 per cent, about 2 mm., of the intended opening, and then constructing a

thereby solving the difficulty. (Fig. 4.) On installation of the lower appliance, contact between the mandible and maxilla existed only at two points: the lower left molar and the right cuspid, offering only a partial support to the jaw in the new maxillomandibular relation.

A month rest-period was instituted at this stage to allow for relaxation and observation. I was determined to tread lightly and very cautiously in this "dangerous and highly experimental field of increasing the vertical

maxillomandibular dimension," as to which Schuyler so aptly warns the profession.[1] During this rest period, the patient assured me that she was feeling quite comfortable in the newly increased maxillomandibular relation.

The rehabilitation of the lower jaw now established a foundation upon which it was possible to calculate accurately the added increase in the vertical dimension needed to complete the bite-opening process. The plan decided upon in connection with the rehabilitation of the maxilla required the construction of a three-quarter crown for the molar, which, when completed, increased the vertical dimension of the maxillomandibular relation the calculated additional 2 mm. In addition, jacket crowns were to be made for the four anterior teeth: two of porcelain for the central incisors and metal jackets with baked porcelain veneers for the cuspids. In view of the fact that the anterior teeth were now repositioned owing to the orthodontic treatment, I thought it advisable to splint these teeth together permanently for stability. Furthermore, since the cuspids were to serve as two of the three abutment teeth, for retention of the partial denture, and the molar was to be the third, the rigid union of the four teeth would mean greater resistance to the thrusts and stresses incidental to an extensive restoration.

Fig. 8.—Completed case.

The splinting and construction of the jackets and abutments, together with the partial denture, were accomplished in the following manner: The molar three-quarter crown was made first. Then the four anterior teeth were carefully prepared for jacket crowns in the generally accepted manner. Provision was made, in preparation of the cuspids and molar, for the reception of the female jackets of the precision attachments which were to be soldered later to the abutments. After accurate individual thimble compound impressions of the four prepared teeth were obtained, the molar three-quarter crown was replaced, a bite registration was obtained and plaster impressions were taken. After dies were made and articulated, the cuspid metal jackets were constructed, in accordance with the raised bite as indicated by the length of the molar crown. Two metal copings were then cast for the central incisors and two metal cores for the reception of the lateral incisor porcelain jackets. These cores were soldered to the cuspid jackets and central copings, and the copings soldered to each other. (Fig. 5.) This six-unit section, when later cemented, formed the splint and permanent retainer. The four porcelain jackets were then made, together with veneers for the cuspids. After the anterior section was completed (Fig. 6), a partial denture was constructed, utilizing one of the standard makes of precision attachments for its retention.

Outcome.—This brought to a close the correction of this congenital oral deformity, which required nearly two years. The results obtained are evident in the final casts and photograph. (Figs. 7 and 8.) My reward above the financial remuneration is the patient's cheerful personality, reflected in her smile of gratitude, indicating a complete transition of her mental attitude.

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RESTERILIZATION OF DENTAL INSTRUMENTS BY THE USE OF ALCOHOL AND FLAMING

By Louis I. Grossman, D.D.S., Dr. med. dent., and J. L. T. Appleton, B.S., D.D.S., Sc.D., Philadelphia, Pa.

DURING the course of root-canal treatment, it sometimes becomes necessary to resterilize instruments that have been in contact with grossly infected or questionably sterile areas of the tooth under treatment or with adjacent teeth. Instruments which are confined to the root canal itself, *e.g.*, files, reamers and broaches, are quickly and effectively sterilized in a molten metal sterilizer. Long-handled instruments, however, are generally dipped in alcohol and flamed.

Immersion of the working end of an instrument in alcohol followed by flaming has certain advantages; namely, economy of time, economy of expense, general availability and simplicity. The effectiveness of this method, however, at least as far as dental instruments are concerned, has not been studied. Sanderson limited his investigation to glass rods and scalpels and found that immersion in methyl alcohol followed by flaming destroyed the non-spore-forming organisms, but had no effect on spore formers.

For resterilizing instruments during root-canal work, Hall recommended flaming the instrument, then putting it back in alcohol until ready for use. He said "Scissors, pliers, pluggers, etc., can be immersed in deep (alcohol) wells for sterilizing and flaming. After any instrument is flamed, it should again be dropped in the alcohol bath, to cool and be better sterilized." It is assumed that the method was used empirically, since no proof of its effectiveness is mentioned.

Walker, taking issue with immersion in alcohol and flaming as an effective method of sterilizing dental instruments, said: "The practice of immersing an instrument in alcohol and igniting the alcohol has no germicidal value. Tests have shown that a thermometer dipped in alcohol and ignited will not register more than 80 C." It must be pointed out, however, that a thermocouple would have been a more sensitive indicator of the temperature change resulting from ignition of the alcohol, since the glass wall of a thermometer is a poor conductor of heat.

In view of the more or less general employment of alcohol and flaming for sterilizing instruments used during root-canal practice, and because no definite evidence of the effectiveness of the method was available, laboratory and clinical studies were undertaken by us.

LABORATORY STUDY

Dental instruments of various kinds including excavators, explorers, hoes, chisels, scalers, etc., were sterilized by autoclaving. About one-half inch of the working blade of each instrument was then covered with fresh saliva and exposed to the air until dry. The blade of the instrument for a distance of about 1 inch was then momentarily dipped in alcohol, flamed, dipped in alcohol again and flamed. A culture on a blood-

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agar slant was then made. A control culture was arbitrarily made of every fifth instrument by passing the blade of the instrument (without dipping in alcohol and flaming) across a blood-agar slant. Cultures were incubated at 37° C. for at least ninety-six hours before they were examined.

Five alcohols were examined in this study: (1) methyl alcohol; (2) denatured alcohol; (3) ethyl alcohol; (4) n-propyl alcohol, and (5) butyl alcohol. It was thought that the differences in specific heat of combustion might result in varying degrees of antibacterial effect. For example, butyl alcohol might be expected to have a greater thermal effect as a result of combustion than propyl alcohol, and therefore a greater antibacterial effect; propyl would be expected to have a greater thermal effect than ethyl alcohol, etc.

The work was divided between us and the so-called "blindfold" method of testing was used; *i.e.*, the alcohols were identified by letter rather than by name, and to obviate any possibility of the person's being able to identify a particular alcohol by familiarity or deduction, the identifying letters were changed from time to time. All the alcohols used were colorless. Further, to preclude the possibility of bias or error, in at least two series of tests, the instruments were divided into two sets. The blades of one set of instruments were immersed in saliva, while the blades of the other set were immersed in distilled water. The instruments were then set aside to dry. Any bias or error in technic would be expected to become evident in the control (distilled water) as well as in the contaminated (saliva) set. These sets were identified by number only and tests were performed in the manner already described.

The effect of alcohol alone, without flaming, was also tried. The working blade of the instrument was dipped in alcohol and allowed to dry in the air. The process was repeated, and a culture from the instrument was then made. The procedure of dipping in alcohol and air drying took about five minutes and would therefore have no practical application, but it was done to determine whether flaming enhanced the sterilizing effect of the alcohol.

The results of these tests are summarized in Table 1.

TABLE 1.—LABORATORY DATA

	Controls		Without Flaming			With Flaming		
	Positive	Negative	Positive	Negative		Positive	Negative	
Methyl alcohol	15	1	9	19	(67%)	1	37	(97%)
Denatured alcohol	16	0	1	27	(96%)*	3	35	(92%)
Ethyl alcohol	16	0	5	23	(82%)*	3	35	(92%)
Propyl alcohol	16	0	9	19	(67%)	5	33	(86%)
Butyl alcohol	16	0	15	13	(46%)	2	36	(94%)
Total	79	1	39	101	(Av.71%)	14	176	(Av.92%)

*Theoretically, there should be no difference in effectiveness between denatured and ethyl alcohol. The mean average of these two values (89 per cent) is probably more significant than either value alone.

From an examination of the data in Table 1, it may be seen that there is no striking advantage in using one alcohol or another, and that with the use of alcohol and flaming, sterilization is more certain than with alcohol alone.

CLINICAL STUDY

Dental instruments, such as excavators, explorers, chisels and burs, which were being used in the course of a root-canal operation, were collected from stu-

dents working in the operative clinic. At such times, when instruments from root-canal operations were not available in sufficient numbers, those being used for cavity preparation were employed instead. In all cases, the operative work was conducted with the protection of a rubber dam so that the instruments did not come in contact with saliva or blood. At the time the instruments were collected for the tests, each student was asked to pick out those instruments that he had reason to believe were not sterile because they had been in contact with carious tooth structure, infected pulp tissue, etc. A control culture from the blade of the instrument or the head of the bur was first made on a blood-agar slant. The blade of the instrument for a distance of about 1 inch (or the head of the bur and part of the shaft) was then dipped in alcohol for a moment and flamed. The procedure of immersion and flaming was repeated a second time and a culture was then made on a fresh blood-agar slant. Cultures were incubated at 37° C., and examined only after ninety-six or more hours of incubation.

TABLE 2.—CLINICAL DATA

	Controls		With Flaming	
	Positive	Negative	Positive	Negative
Denatured alcohol	146	15 (9%)	19	142 (88%)

Only commercial denatured alcohol (70 per cent) was used in the clinical study, because of its general availability and economy, and because the laboratory study showed it to be as effective as any of the other alcohols examined. The results are summarized in Table 2.

SUMMARY

1. Laboratory and clinical tests were made to determine the effectiveness of the following procedure: The working blade of an infected dental instrument was dipped in alcohol, which was then ignited. Immediately after the alcohol had burned off, the dipping and ignition were repeated. Tests for a single immersion and flaming were not made because the time factor involved in repetition of the procedure is negligible and it was believed that this repetition provided an additional factor of safety.

2. Five kinds of alcohol were tried in the laboratory tests: (a) methyl, (b) denatured, (c) ethyl, (d) n-propyl and (e) butyl.

3. In the clinical tests, commercial denatured alcohol (70 per cent) was used.

4. It must be emphasized that: (a) The instruments used in the clinical tests had not come in contact with saliva or blood; which would tend to make sterilization under such circumstances more difficult. Instruments stained with blood should first be cleaned by immersion in hydrogen peroxide U.S.P., then wiped dry. (b) The instruments had been sterile at the beginning of the root canal or operative work and that the method under consideration was used only in reestablishing sterility. This method is not recommended as a primary method of dental instrument sterilization.

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OHIO'S INFLUENCE UPON THE DEVELOPMENT OF AMERICAN DENTISTRY

By FREDERICK C. WAITE, Ph.D., Cleveland, Ohio

THE Dental Profession celebrated in Baltimore, March 18-20, 1940, what is called the Centennial of American Dentistry.

It is fitting that the combined national observance should be at Baltimore since in that city in midwinter of 1840 was inaugurated, not the beginning, but the determining factor in the completion of an organized American dental profession.

The structure of any profession rests upon three supports: a literature, an organization and a definite educational program. Without all three of these, no grouping of individuals of similar vocation can properly be called a profession. Literature, the first of these three supports, requires a considerable degree of learning for its production. Therefore, a few professions have long been termed "learned." There can be no professions of ordinary vocations. Only those vocations that are based on intellectual capability rather than on manual or muscular performance can become professions.

The oldest of the professions is teaching; for if an individual or a group becomes learned, there must have been teaching. Next in age is probably theology, but jurisprudence and medicine are nearly of the same antiquity because, in early civilization, practice of these three professions was combined. The priests of early civilizations were also judges and physicians for the people whom they served.

These four, teaching, theology, jurisprudence and medicine, are the original learned professions. For several thousand years they continued to be the only learned professions, until, in the nineteenth century, from one or another of these original four, arose a secondary group of professions, among them dentistry.

Some of the simpler phases of dentistry have been practiced for many thousands of years, but the beginnings of the first of the three essentials to the creation of a dental profession did not appear until the second quarter of the Eighteenth Century, when, in 1728, Pierre Fauchard published in France his book "Le Chirurgien-Dentiste."

From this beginning of a dental literature, growth was slow and almost all in France, and the middle of the eighteenth century saw only about a dozen items in dental literature. In the second half of the eighteenth century, dental literature extended to Great Britain, Holland, Germany and Italy. In 1783 appeared what may be called the first item of American dental literature, the book by Robert Woofendale the elder, since, although this book was not published in the United States, it is largely based upon the practice of Dr. Woofendale in New York City from 1766 to 1768.

In the early nineteenth century, American dental literature grew slowly, only about a dozen items being contributed in the United States up to 1829, when occurred the most influential single event in the history of American Dentistry, the publication of Fitch's "System of Dental Surgery." This book appeared

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one hundred and one years after the first edition of Fauchard's book and next to it is the most important item in the history of dental literature before 1840. It was far superior to any book on dentistry in any other language and it marked the beginning of the advance of American dentistry, which, in thirty years, took away from France the leadership in world dentistry which it had held for more than a century.

This book by Fitch appears to have been the stimulus to the next step in advance. Fitch's work made American practicing dentists far more interested in literature than they had ever been before, and, in 1834, in New York City was organized the first dental society, among the primary objects of which was accumulation of a library. Thus, the second primary essential of a dental profession was recognized, the organization of a dental society. Development of the local society in five years led to the organization of a national society, the American Society of Dental Surgeons, and immediately this gave birth to the first dental periodical.

The third and final essential was recognized with the organization of a dental college, as the beginning of a dental educational program, and it is the issue of the charter of this college, the Baltimore College of Dental Surgery, in February 1840, that we commemorated in March of this year.

It should be appreciated that dental literature lies at the base of the dental profession. For more than a century, dental literature grew slowly, but steadily, and then, within six years, the two other essentials were recognized—professional organization and an educational program, which made complete the three supports of this profession.

It is true that all these events up to 1840 occurred in the seaboard states, and there the American dental profession was born, but in commemorating the birth, we should not lose sight of the period of infancy and adolescence of the profession, and where and under whose leadership the profession grew to adult stature. It is to this that I wish now to give attention.

Logically, in the organization of the American Society of Dental Surgeons in August 1840, the majority of the participants were practitioners in the larger cities of the seaboard states. This was due both to density of population and to distances, because, before the era of railroads, contact between the older and newer states was not intimate. However, among the twenty-four charter members of the American Society of Dental Surgeons was one Ohioan, Melacthon Rogers, of Cincinnati, a graduate of the Medical College of Ohio in 1826, who became professor of dental pathology and therapeutics in the organization of the Ohio College of Dental Surgery.

Dr. Rogers was the only member from west of the Alleghenies. Within two years, two more Ohioans became members, W. E. Ide, of Zanesville, and Benjamin Strickland, of Cleveland. These memberships were the beginning of Ohio's contribution of members to the organized American dental profession. Therefore, we may say that Ohio began to participate in the organized profession one hundred and one years ago.

The Baltimore College of Dental Surgery was definitely a southern institution. Maryland was a southern state and south of the Mason and Dixon line, and the support of this dental college was largely from the south, two-thirds of its students prior to the Civil War coming from southern states, and only three from Ohio. This college did not influence dentistry greatly in the northern states. Few of its graduates were from Pennsylvania, New Jersey or New York, and scarcely any came from New England or settled in these states for practice.

The states newly formed from the Northwest Territory were growing with great rapidity, and, in the growth, Ohio

was unquestionably the leader. By 1840, it had become the third state in the Union, in population surpassed only by New York and Pennsylvania.

Moreover, political differences were arising. By 1840, slavery had become a sectional question that was to divide North and South. Few young men from northern states went to southern states to procure their professional education, and travel was difficult and expensive, either by stage or by water. Railroads had not yet been constructed west of the Allegheny mountains. Some of these conditions had resulted in the establishment of medical colleges in the area of the Northwest Territory, the earliest, in 1819, the Medical College of Ohio at Cincinnati. By 1840, that city had become the medical center of the west, the seat of medical colleges and of the publication of medical journals.

There is not time here to give in detail all the reasons why Cincinnati became the metropolis of all the area west of the Allegheny mountains, but the major reason was accessibility and commerce by water-borne traffic upon river and canals.

The conditions that resulted in establishment of a medical college in Ohio in 1819 emphasized the need for a dental college twenty-six years later in what was then called the West; but, by 1845, the conditions were aggravated by the tremendous growth in population in those twenty-six years, and it was logical that a dental college should be established in the city where was located the medical center of the west.

Therefore, in 1845, at Cincinnati, the Ohio College of Dental Surgery was established, and thus there came to be an eastern and a western American dentistry radiating from the two dental colleges, at Baltimore and at Cincinnati.

The first college logically should have been established not in Baltimore, but in Philadelphia as the medical center of the East and on the border of the North and the South, but still in the North, which has supported education of all grades, including professional, more ardently than has the South. Hence, the western college in Cincinnati was more favorably located than the eastern college in Baltimore and its contributing territory was more compact. Moreover, from the conditions of the Civil War and the results that followed, the college in Cincinnati suffered less than the one in Baltimore.

If we roughly divide the East from the West by the Allegheny Mountains, as was customary prior to the Civil War, it is evident that the West had a tremendously larger area and, after a time, a greater population, than the East, and therefore western American dentistry outgrew eastern American dentistry.

A few months prior to the organization of the Ohio College of Dental Surgery, in August 1844, the Mississippi Valley Association of Dental Surgeons was organized, the second dental society that was more than local. This society was the parent of many state dental associations. It was this association that inspired the organization of the college in Cincinnati, in 1845.

The first president of this association was Jesse W. Cook, its first secretary, James Taylor (M.D., 1841, Medical College of Ohio). These two men were the leaders in organizing the Ohio College of Dental Surgery. The association continued to be active for more than fifty years.

Under the influence of this association, the *Dental Register of the West* was established, in 1847. This quarterly journal. the second journal in the world, continued publication for seventy-seven years, until 1923. It had several advantages over the slightly older *American Journal of Dental Science,* which came to be essentially a journal personally owned by Chapin A. Harris, publication of which ceased with his early death, in 1861.

The *Dental Register of the West,* which

was controlled by the Mississippi Valley Dental Association, continued publication long after the first journal had disappeared. Thus, Ohio had far more influence in current dental literature than Maryland and also more influence in the early organization of dental societies.

We would not belittle the claims of the Baltimore college. It certainly has a valid claim to priority over Ohio. The instruction in Bainbridge was not in a chartered college and authority to grant degrees was lacking. It was a school.

In quality of dental education during the fifty years from 1840 to 1890, the college in Ohio was ahead of the college in Baltimore. The Baltimore college often makes mention of Hayden and Harris, but it should be remembered that Dr. Hayden died in 1844, when the college was but 4 years old, and Harris died in 1861. After the Civil War, the leadership in eastern dental education passed to Philadelphia.

It should also be recalled that Chapin A. Harris, largely because of whom Maryland claims preeminence in dentistry, was born not in Maryland, but in New York, and received both his medical and dental education in Ohio. He practiced medicine for several years in Seville, Medina County, only 40 miles from here, and when the Ohio State Dental Society begins to mark the shrines of dentistry, it should not forget the village of Seville.

In the period before the Civil War, the Baltimore college graduated twenty-one classes, a total of 300 men; whereas, in the same period, the college in Cincinnati graduated but sixteen classes, with a total of 120 men. However, the graduates from Cincinnati settled in practice in a far wider range of territory than the graduates from Baltimore.

As the country grew in population toward the Pacific Ocean, it was the graduates of the Cincinnati college who provided that area with dental service, and it was through these graduates that new dental colleges were established. The dentistry that began in Ohio is the parent of all the dentistry west of the Allegheny mountains and north of the Ohio River.

Dental practice has two major factors, quantity and quality. Quantity can be measured statistically as to students, graduates and practitioners, but quality is not adapted to statistical measurement. This is the primary difference between a craft and a profession. The products of a craft can be examined and, if of good quality, can be accepted or, if of poor quality, can be rejected. This is exactly what was done in the craft guilds of the Middle Ages. Each craft maintained a central hall to which each craftsman brought his products for inspection. In the case of gold or silver articles, if the product was good, the officer of the guild stamped it with what was called the hallmark, a word in common use today to signify excellence. The sterling mark which today is found on silver is the medieval hallmark of the guild of silversmiths.

The contribution of the professional man is not something that is manufactured and can be inspected to determine proficiency and stamped to indicate its worth. The professional man contributes service, and the only means that has been devised to determine the proficiency of that service is a test of the capability of the individual before he is permitted to offer service. Hence, more than 600 years ago, the plan of examining professional men, and when they were found apparently capable, giving them a license to practice, was developed.

In the United States, this plan was early put into use in the medical profession, and as long as dentistry was practiced chiefly by licensed physicians, the licensure in medicine presumed a reasonable capability in dentistry.

However, when dentistry assumed an independent status, there was no control based on the ability of those who offered their dental services to the public.

It is true that in 1841 in Alabama a statute provided for examination and li-

cense of dentists, but it was little observed. More than twenty-five years later, coincidently, in the year 1868, in three states, Kentucky, New York and Ohio, laws were enacted to provide for the licensure of dentists. The influence of Ohio upon the dentistry of Kentucky had been intimate because of proximity. Therefore, we may say that in two areas, namely in Ohio-Kentucky and in New York, licensure was simultaneous. One of these areas was in the territory of eastern dentistry; the other, in the domain of western dentistry.

Thus, Ohio shares with one other state priority in examination and licensure, but, in this phase of dentistry, Ohio later took leadership when it was from this state that a federation of all dental licensing boards was proposed, for uniformity. It was an Ohioan who carried through the establishment of such a federation.

In dental national organizations, Ohio has also been in the forefront. In the early dental conventions, Ohio men were prominent. The American Dental Association was organized just before the Civil War, and it was a Cleveland man, W. H. Atkinson, who was its second president, in 1860. The second meeting of the American Dental Association was held in Cleveland.

Nine other Ohio men have been president of the American Dental Association; namely, George Watt, of Xenia, in 1862; Jonathan Taft, of Cincinnati, in 1868; George F. Keely, of Oxford, in 1876; F. H. Rehwinkel, of Chillicothe, in 1877; H. A. Smith, of Cincinnati, in 1881; Charles R. Butler, of Cleveland, in 1888; Homer C. Brown, of Columbus, in 1914; L. L. Barber, of Toledo, in 1917, and Frank M. Casto, of Cleveland, in 1935.

Ohio has been called the Mother of Presidents, seven of the thirty-two presidents of the United States having been born in Ohio. This state may also be said to be the mother of the presidents of the American Dental Association, since ten of the seventy-seven men who have held that office were Ohioans, the number being equaled only by the number from Illinois and exceeded only by the eleven presidents from New York.

In the location of meetings of the American Dental Association, Ohio is also in a leading position. In this state, the national association has met six times: in Cleveland in 1862; Cincinnati, 1867; Put-in-Bay, 1873; Cincinnati, 1882, and Cleveland, 1911 and 1923. The seventh Ohio meeting and the fourth Cleveland meeting is scheduled for the present year.

Only the State of New York exceeds Ohio in the number of meetings. It has had twenty-three meetings; but twelve of these were at Niagara Falls and five at Saratoga Springs; and Ohio cannot compete with New York in summer resorts.

The American Dental Association has had seventy-seven presidents; which would, if evenly distributed, be less than two per state, or 6 per cent for each of the present forty-eight states, but of these seventy-seven individuals, ten, or 13 per cent, have been Ohioans.

To sum up this record: From Ohio came one of the twenty-four charter members of the American Society of Dental Surgeons in 1839. In 1844, there was organized the second dental society that was more than merely local, and out of this organization grew six state dental societies. In Ohio, in 1845, the second dental college was organized. In Ohio, the second dental journal, which continued for seventy-seven years, was founded. In Ohio, dental licensure was established as early as in any other state, and Ohio led in standardizing examination and licensure through the founding of a national federation of licensing boards. Since the founding of the American Dental Association, Ohioans have had a large share in conducting its activities.

These facts are presented, not with any intention of depreciating the centennial

celebration in Baltimore in 1940, but to call attention to the large share of Ohio and Ohioans in the progress of American dentistry, with the hope that when, four or five years hence, the centennial of important dental events in Ohio is celebrated, these facts may be enlarged and brought to the attention of American dentistry and the American people.

In Ohio during nearly a century, many individuals have given extensive and important service to American dentistry. Among them all, one name stands out prominently. That name is Jonathan Taft.

Jonathan Taft was born in Brown County, Ohio, in September 1820 and died in Ann Arbor, Mich. in October 1903, at the age of 83 years.

He studied dentistry under a preceptor and began practice in 1843. After six years of practice, he attended the Ohio College of Dental Surgery, where he received the degree of D.D.S., in 1850. He received the honorary degree of M.D. from the University of Michigan in 1881. He practiced in Ohio for fifty-eight years and was the leading dental practitioner in Cincinnati in the latter third of the nineteenth century.

He became a member of the Mississippi Valley Association of Dental Surgeons in 1848 and became its president in 1852, at the age of 32. His membership continued for fifty-four years. He was one of the organizers of the American Dental Convention in 1855 and its president in 1863.

In 1859, he was one of the twenty-four who organized the American Dental Association and was its secretary for nine years from its organization until 1868, when he became president. He was one of the organizers of the Ohio State Dental Society in 1866 and later its president. He was a member of more than seventy professional organizations and for many years attended from fifteen to thirty meetings a year. He is said to have attended more dental meetings than any other individual and he was considered the best known American dentist.

In 1854, he became professor of operative dentistry in the Ohio College of Dental Surgery, continuing in this position for twenty-five years. During about fifteen years of this time, he was dean of the school.

In 1875, he organized the College of Dental Surgery of the University of Michigan, and he was professor of operative dentistry and dean for twenty-eight years, until his death. Into the organization of this the first dental college of a state university, he put his ideals of a high type of dental education. He thus had a teaching career of forty-nine years, but his educational influence extended far beyond the two institutions of which he was dean, because the College of Dental Surgery of the University of Michigan became the pattern for all other state university dental colleges and for many other schools, including the School of Dentistry of Western Reserve University.

Dr. Taft was one of the founders of the American Institute of Dental Pedagogics. He was one of the organizers of the National Association of Dental Faculties in 1884 and its president in 1899.

He made the first of his many contributions to dental literature in an article in the *Dental Register of the West* in October 1848. In 1856, he became editor of this important journal, continuing in that capacity for forty-four years.

In 1859, he published his book on operative dentistry, the leading textbook on the subject during the latter part of the nineteenth century, and which ran into several editions and was translated into German and other foreign languages.

In 1886, Dr. Taft compiled and published the first index to periodical dental literature in the English language.

It was he who inspired the first law regulating the practice of dentistry in Ohio, in 1868. This was coincident with

similar laws in Kentucky and New York, the first effective legal regulation of dental practice in America.

Dr. Taft was for many years, beginning in 1868, a member of the Ohio Board of Dental Examiners. With the purpose of securing uniformity of licensure in all states, he proposed and carried through the organization of the National Federation of Dental Examiners, of which he was president for the first four years of its existence. He may well be called the father of dental licensure.

Jonathan Taft excelled in practice, in dental organization, in dental education, in dental literature and in dental licensure.

Through the agency of Jonathan Taft, Ohio has made a great contribution to American dentistry and his name deserves to stand high in the list of the immortals of dentistry.

CAVERNOUS SINUS THROMBOSIS RESULTING FROM A MANDIBULAR ALVEOLAR ABSCESS OF A DECIDUOUS MOLAR: REPORT OF A CASE

By HARVARD D. JACOBS, D.M.D., Dorchester, Mass.

History.—A boy, aged 4 years, was brought to the accident ward of the Worcester City Hospital, September 28, 1938, suffering from pain and swelling of the lower right jaw. The father stated that the boy had apparently been well until two days before entry, when he was observed to have a swelling of the lower right jaw and appeared sick, with anorexia and a cough, without coryza, chill, constipation or diarrhea. When the child grew worse and the swelling increased, the family physician was called. The application of hot flaxseed poultices to the jaw was recommended, but as this treatment brought no relief, after one day the doctor advised hospitalization.

A history of the character of the pain was not obtainable. The family and past history was unimportant.

Examination.—On entry, the swelling of the right jaw was not tender, but was indurated and extended from the right mental area to the angle of the right mandible and the submaxillary area. There was an acute infection of the lower first and second deciduous molars.

The gingivae in this area were edematous, hyperemic and non-fluctuant. However, by rolling a finger upward from the mucobuccal fold, thin, yellow purulent matter could be expressed from the gingival crevices around the necks of the teeth. These deciduous molars were badly broken down and carious. The mouth could be opened only wide enough to admit one finger. The breath was fetid and the tongue furred. There was no palpable swelling in the floor of the mouth.

The general physical findings were as follows: The skin was hot, dry and pale. The eyes were normal, with no nystagmus or strabismus. The ear drums gave no evidence of involvement. There was a preauricular and superior deep cervical lymphadenopathy on the right side. The nose was clear except for a few clots of dried blood in both anterior nares. Examination of the throat was difficult. However, moderate injection of the tonsils and pharynx, with no exudate or membranes, was evident. The neck showed no stiffness or retraction.

The chest was of normal shape. The breath sounds were diminished slightly at the right base posteriorly. The percussion note was resonant throughout. The pulse rate was 168, with regular rhythm and no murmurs.

The abdomen was soft and not distended, with no tenderness or palpable masses. The liver and spleen were not palpable.

The extremities and genitalia were normal. The reflexes were physiologically normal. Neurologically, there was no evidence of pathologic reflexes. Kernig's sign was absent.

Diagnosis.—Acute alveolar abscess of the lower right first and second deciduous molars, with pharyngitis and rhinitis, was the diagnosis.

Treatment.—The immediate treatment consisted of swabbing the mouth with a warm normal saline solution every two hours and applying hot flaxseed poultices continuously. The systemic treatment was supportive.

Course.—On the second day in hospital, the temperature, which was 101.4° F. on entry, rose to 103.5, and assumed a septic aspect, being low in the morning and high in the afternoon.

On the third day, the temperature reached a maximum of 105° F. Subsequently, it was of a "picket-fence" character. There was also a concomitant increase in the pulse rate. Urinalysis revealed many granular casts. The white blood count was 32,000, with 84 per cent polymorphonuclears. On repeated tests, on different days, the count varied from 16,000 to 63,000. Blood cultures were negative. A smear of pus from the alveolar abscess showed *Staphylococcus aureus.*

On the fourth day, the condition of the patient became more critical. The involved first and second deciduous molars were extracted and drainage was established. However, there was little purulent discharge.

On the fifth day, the symptoms become complex, with many neurologic manifestations: (1) definite neck rigidity; (2) a right Babinski reflex; (3) a right Brudzinski sign, and (4) active and equal knee-jerks.

A lumbar puncture was made. The spinal fluid was clear and contained 210 white blood cells per cubic millimeter, 700 mg. of chlorides, 85 mg. of sugar and 15 mg. of total protein. A culture of the spinal fluid showed no growth. The initial spinal fluid pressure of 400 mm. was reduced to 250 mm.

A neurologic examination suggested meningism and the possibility of some local intracranial suppuration, with a septicemia as an etiologic basis, in spite of the recent laboratory findings regarding the spinal fluid. It was suggested that a local osteomyelitis must be considered and pyemia might result. A cavernous sinus thrombosis was also considered.

Daily clyses of 1,000 cc. of 5 per cent glucose in saline were given; also two direct transfusions of 150 cc. each of whole blood. Prontylin and prontosil were administered with no marked effects. Roentgenograms of the mandible were negative for bone pathosis. On the eighth day in hospital, the abdomen became firm and distended. Enemas were given with fair results. Proptosis of the right eye was evident. Respiration became very labored. There was a sanguineous discharge from the nose. From this time on, the patient failed very fast. Death occurred on the tenth day.

The clinical diagnosis was: (1) alveolar abscess; (2) upper respiratory infection (?); (3) meningism, and (4) suppurative encephalitis, with septicemia.

Necropsy.—There was a foul odor present and the alveolar processes of the right lower jaw were partially covered by a dirty brown clot. The deciduous molars were missing on that side and the canine and incisors were very loose. The clot was removed, to reveal a sloughed-out irregular abscess cavity, extending down to the bone. The adjacent tissues were dark and inflamed, but the bone was firm and apparently not involved. A few soft swollen cervical glands were palpable.

Head: The dura was intact and the pia arachnoid showed slight edema, but no inflammation. The brain weighed 1120 gm. and was of normal configuration and shape. The ventricles contained clear spinal fluid. Serial sections revealed no gross disease of the brain tissue. The nerve heads and the arteries were negative. Retraction of the dura revealed oozing of purulent fluid in the sheath around the right cavernous sinus. The lumen showed a well-organized thrombus, containing two small plaques of pus extending nearly to the opening into the terminal portion of the sigmoid sinus. The thrombus seemed to extend from the venous plexus to about the optic nerve. The inflammation had extended for a short distance into the sella turcica, and the pituitary body was apparently surrounded by a peculiar gelatinous material. The adjacent porous portions of the ethmoid and sphenoid bones were soft and dark and exuded thin gray pus. Smear of this region showed infection due to a gram-positive short chain streptococcus. The

petrous portion of the temporal bone was clear and the middle ear was negative.

Thorax: The pericardial cavity contained a minimal amount of straw colored fluid.

Heart: The weight was 70 gm. The size and shape were normal. The myocardium was dark and fairly firm. The pulmonary valve showed four well-formed cusps, but appeared competent. The other valves were negative. The coronary arteries showed no gross lesions.

Pleural cavities: The left cavity contained 100 cc. of sanguineous fluid. The right cavity contained 300 cc. of bloody purulent fluid and showed a few fresh adhesions of fibrin. The parietal pleura was darkened by numerous hemorrhagic spots.

The left lung weighed 165 gm. The surface was smooth, but darkened. The apical region was crepitant. There were numerous raised areas of infarction and the dependent portions of the lung were rather firm. A section showed hemorrhagic edema and dense red-gray areas suggestive of bronchopneumonia. The infarcts were dark red and roughly triangular with the base on the surface. The centers of some had broken down and contained pus pockets. The bronchi were congested and a few exuded purulent fluid on pressure. The right lung weighed 165 gm. The pleural surface was opaque, roughened and hemorrhagic. A section was similar to that of the other lung and showed a few small areas of infarction and marked congestion. In the lower lobe, just under the pleura in the midaxillary line, was a single abscess cavity, having a ragged necrotic wall measuring 3 cm. in diameter. It contained rich pus that could be expressed via a medium-sized bronchus. A smear of this pus pocket, as well as the septic areas of the other lung, showed gram-positive short chain streptococci.

Mediastinum: A few soft swollen lymph glands were noted.

Abdomen: The peritoneal cavity was free of fluid and had no adhesions. There were a few swollen mesenteric glands.

Spleen: The weight was 85 gm. The surface was smooth and shiny. The organ was rather soft and cut easily, presenting a dark purple pulp that came away readily with the knife.

Gastrointestinal tract: The esophagus was negative. The stomach was dilated with gas and greenish fluid. The mucosa was grossly normal. The small bowel was distended with gas and dark fluid feces. The large bowel was flattened and contained only a small amount of soft fecal material. The appendix was not inflamed. The mucosa was normal throughout.

Liver: The weight was 639 gm. The surface was smooth and glistened. The organ was rather firm and regular in outline. Sections were of firm consistency, yellow-brown, with no gross areas of infarction.

Gallbladder: Golden brown bile, with no stones, was noted. The ducts were patent.

Pancreas: There was no macroscopic evidence of disease.

Suprarenal glands: Bilateral cavitation was present.

Kidneys: The left kidney weighed 30 gm. The surface was even. The capsule could be stripped away easily. The cortex was normal. The pyramids were well demarcated The pelves were not dilated. There was no gross evidence of vascular disease. The right kidney weighed 55 gm. and was similar to the left. The pelves and ureters were negative.

Bladder: The bladder contained 50 cc. of amber colored urine. The mucosa was soft and smooth.

Genitalia: The examination was negative except for scrotal edema.

Blood vessels: There was a septic thrombus in the right cavernous sinus as described above. The vessels were otherwise negative.

Blood culture: Streptococci were present.

Lung abscess: A smear showed streptococci.

Microscopic findings: The clot from the cavernous sinus was a septic thrombus. The pituitary showed slight edema. The heart was negative. The lungs showed clumps of bacteria, inflammation, degeneration and necrosis, hemorrhage and edema and bronchopneumonia. The spleen showed edema. The liver showed a cloudy swelling. The pancreas was negative. The kidneys showed a cloudy swelling. Muscle tissue showed congestion, hemorrhage and edema.

Anatomic diagnosis: The diagnosis was: alveolar abscess; lung abscess (right); empyema of the right pleural cavity (streptococcic) and septic thrombus in the right cavernous sinus.

53 Washington St.

EARLY DIAGNOSIS OF INTRA-ORAL CANCER

By Peter A. Nelson, M.D., Chicago, Ill.

THE relationship of the practice of dentistry to the early diagnosis of cancer of the lips, buccal surface, tongue, hard and soft palate and tonsil is apparent. The relationship to diagnosis of carcinoma of the salivary glands, nasal accessory sinuses and orbit is less apparent, but often, before a diagnosis, the dentist may be consulted because of aching teeth, the pain being referred from these lesions. Many times, pain in the upper teeth is the only symptom of carcinoma of the antrum of Highmore.

Early diagnosis and treatment of cancer offer the most effective means for cure of cancer in the oral cavity. The dentist has an important and certainly a responsible rôle in its early detection. He sees, even before the patient does, the white patches of leukoplakia, the early non-ulcerated nodule of cancer, the small ulcerated nodule of beginning cancer. He observes the very beginning of a process that is certain to be fatal if not recognized and treated before dissemination has occurred. The responsibility to know and diagnose early cancer of the oral cavity is in the realm of the dentist. It is a responsibility he must not avoid. Failure to recognize these early lesions permits them to grow, to invade and to be disseminated to local lymph channels and nodes and, at times, to the blood stream and thus to distant organs.

The tendency to early dissemination is marked in the mouth because of the movements required in eating, drinking and talking. It has a moist surface prone to early ulceration and infection. The region has a rich vascular supply and lymphatic drainage. Secondary infection seems to accelerate cancer growth, as well as dissemination. Infection, moreover, decreases the ability of lymph nodes to kill cancer cells or to keep them confined in the gland. Infection destroys or injures one of the important lines of defense.

Cancer of the oral cavity is not unusual or rare as compared to cancers elsewhere in the body, but a cancer of the lip, tongue or buccal surface may be unusual in an individual practice. It is possible that a dentist may never see a cancer of the tonsil, or he may see one only once in ten years or more. He may encounter a cancer of the lip more often, cancers of the buccal surfaces and tongue much less often. The cancer most often seen by a dentist in his practice should be a cancer of the alveolar ridges. In nearly all cases, he will be consulted first if cancer arises on the mucosa near a tooth or on an edentulous surface.

How can a dentist recognize early cancer and differentiate it from benign tumors and infections? Certainly, he cannot be expected to have at his command a knowledge of the origin and clinical course of lesions which he comes in contact with only once in ten years or more. What signs and symptoms should he be able to recognize so that accurate, early diagnosis may be possible? What are the cardinal characteristics of cancer that distinguish it from all other processes in the mouth? A few simple points will aid in diagnosis.

The cancer process usually begins with a small nodule which is not at first

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ulcerated. At this very early stage, macroscopic recognition is extremely difficult, surgical biopsy being necessary to make the diagnosis. Such a nodule will probably be less than 4 mm. in diameter and still fairly movable in the tissues of origin. It is still confined to these tissues. Clinically, it looks and feels no different from the most benign lesion; but it is of recent origin. Something is now present in the mouth which was not there one week or one month ago. It may have been discovered by the physician, or dentist, before the patient knew it was present at all. To discover, diagnose and treat lesions in the incipient stage almost assures complete cure. Such lesions are often discovered accidentally, but their detection is more often the result of careful and painstaking examination of the mouth and lips, which every patient is entitled to. As stated, the final diagnosis is made by the microscope. Therefore, all non-ulcerated nodules of recent origin in the mouth should be subjected to excision and microscopic examination.

From the small non-ulcerated nodule of cancer, the next step is the ulcerated stage. If the nodule contains cancer cells, they continue to grow and soon, either from compression or a failure of blood supply, the surface epithelium breaks down and ulcerates. A red, raw granular surface is now present on a nodule, which may still measure less than 1 cm. in diameter. This granular surface, if irritated with a metal probe, bleeds easily. The bleeding is usually arterial; that is, the blood is bright red and arterial pulsation may be visible. Inflammatory lesions usually are passively congested and bleeding following contact with a metal probe is usually dark venous blood. This early lesion is now almost 1 cm. in size and it has a red, raw surface. On contact, it bleeds arterially. Between the fingers, it feels almost stony. A biting, cutting biopsy forceps applied to the lesion will cut through the tissue without resistance. No pulling or tugging is necessary to separate the excised tissue from the point of origin. In other words, the nodule is made up of friable tissue—the tissue breaks easily.

Following the red, raw granular nodule stage is the stage of secondary infection. The red, raw surface indicates that the blood supply to the overlying epithelium has been shut off by growth and pressure. The surface soon becomes infected. It may now present a gray appearance, as infection and deficiency of blood supply continue. Necrosis of tissues occurs. Now, for the first time, the cancer has a foul odor, the odor being in direct proportion to the amount of dead tissue that adheres to the underlying tumor. As necrosis of the surfaces proceeds, with the growth of the tumor, the edges may become undermined.

At this stage the cancer is usually more than 1 cm. in diameter and has an excavated gray foul center with undermined edges. Palpation between the fingers reveals a stony mass in the tissues with a pronounced ring of hard tissue. The lesion now becomes painful and is tender and sore to the touch. Eating, drinking and even talking are distressing. It has already metastasized, or is about to metastasize, to the lymph nodes of the neck; or the cancer cells are already in or are eroding the blood vessels. It fast approaches the limits of growth and to treat it successfully becomes very difficult. With pain, ulceration and infiltration of deep tissues, the prognosis becomes poor. Pain is nearly always a late symptom, indicating that growth and invasion are occurring in the deeper structures. Pressure and erosion of the nerve endings cause the pain.

Some cancers, instead of ulcerating early, with excavation, grow outward, with a papillary or cauliflower growth. In these cancers, the blood supply to all the component cancer cells is well maintained and ulceration does not occur. The tendency is toward proliferation

rather than infiltration and necrosis. Freedom from ulceration and necrosis maintains this growth free of slough and odor. Lack of infiltration into the deeper structures prevents pressure on nerve endings and hence the lesion is not painful. Lack of infiltration and the tendency to outward proliferative growth prevent the stony hard infiltration of the tissues at the site of origin.

However, the growth, when cut into for a biopsy specimen, is found to be friable, like the infiltrative type. The papillary proliferative type metastasizes much later, and since its base arises in a limited area, less destruction and involvement of normal tissues occur. Papillary tumors, therefore, make a much more favorable response to treatment. They may have been present for a much longer time, but nevertheless have caused far less destruction of the normal structures of the part affected.

We now have a simple basis on which to formulate a method of diagnosis. On observing a nodule or ulcer in the oral cavity, we should ask the following questions:

1. Is the lesion recent or has it been present, unchanged, for a long time? If it is recent, small and not ulcerated, only surgical biopsy can reveal whether cancer is present. We should never temporize with such lesions. They should be excised and subjected to microscopic examination, especially if growth is active. If the nodule has been present for many years and shows no signs of change in growth, careful observation may be employed. If an apparently benign nodule suddenly shows signs of growth and activity, it should be excised to determine the reason for this growth.

2. Is contact bleeding present? If an ulcer bleeds readily after mechanical contact, and especially if the blood is bright red, or arterial, cancer should be suspected. A biopsy must be made, with microscopic examination.

3. Is the lesion hard? Tumors that are very hard and resistant are apt to be cancerous.

4. Is infiltration present? A hard, brownish area of infiltration of underlying tissues is almost diagnostic of cancer. The suspicion of cancer can always be confirmed by the microscopic proof made available by biopsy.

5. Is the process friable? Cancer tissue is hard and contains very little connective tissue stroma. Hence, it breaks off easily. Friability is almost conclusive evidence of the presence of cancer.

6. Are there extensions to the regional lymph nodes? Cancer extension to the neighboring lymph nodes renders the lymph nodes hard and stony. If the capsule of the lymph nodes has been invaded or broken through, the gland becomes adherent to the surrounding tissues. A hard lymph node or a fixed lymph node is always presumptive evidence of cancer. Lymph node metastases may follow devious and bizarre routes. The first evidence of lymph node invasion of a carcinoma of the left cheek may occur in lymph nodes on the right side. The primary site of origin may be cured and may give no evidence of local recurrence, but slow metastases to a lymph node may be present, with no visible or palpable evidence until months later.

7. Does a simple-appearing lesion respond poorly or not at all to treatment? A hard and fast rule should be: Lesions which do not heal after ten days of treatment, or which heal for a short period, only to again ulcerate in a few days, should be suspected of being cancer. In all such chronic lesions, biopsy is mandatory.

The dentist must assume the responsibility of determining that the epithelial cells of the lips and oral cavity are intact before dental examination or repair is begun. Thus, many early oral cancers will be discovered and cured. Only early diagnosis and treatment will increase the permanent cures of cancer of the oral

cavity. It is the duty of dentist and physician alike to contribute skill and energy to the discovery and early treatment of these cancers. The response to treatment of early cancer is complete and certain. The response of far advanced cancer is minimal.

25 E. Washington St.

NEW TREATMENT OF ORAL TUBERCULOSIS

By R. J. FITZGERALD, D.D.S. and A. L. BANYAI, M.D., Milwaukee, Wis.

ONE of us (A.L.B.) began the topical application of cod-liver oil in a case of *lupus vulgaris* in October 1934. The favorable results in this case, together with observations on the beneficial influence of locally applied cod-liver oil upon other types of tuberculosis, have been reported.[1, 2] These reports included cases of tuberculous lymphadenitis, ischiorectal fistula, empyema, fistula secondary to tuberculous epididymitis and tuberculous ulcers of the pharynx and the larynx.

Guy,[3] writing on the history of cod-liver oil as a remedy, states that the use of fish oils in medicine is mentioned by Hippocrates, and that Pliny writes that the oils of the livers of the dolphin were used for eruptions of the skin, not only as an external application, but also internally. Sollman[4] quotes F. W. Headland, who wrote that the oil from the livers of fishes was utilized as a remedy among the Hindoos and Burmese in very ancient times. Sollman writes that cod-liver oil was used as a folk medicine in the maritime districts of the countries bordering on the North Sea and the Baltic, in Scandinavia, Germany, Holland and Great Britain, especially in chronic rheumatism, rickets, scrofula and phthisis. The first known mention of its professional use was made by T. Percival (1771) from the Manchester Infirmary. Reports on its value in chronic rheumatism, sciatica and lumbago were followed by numerous commendatory papers, extending its use to scrofula and tuberculosis. The first professional use of cod-liver in rickets is credited to Schuette (1824).

Mellanby[5] was the first to produce rickets experimentally in animals by keeping them on a diet deficient in vitamin D and also in calcium. He was able to prevent the development of rickets in these animals by the addition of a few cubic centimeters of cod-liver oil. It was assumed by him that the fat-soluble vitamin A was the antirachitic factor. McCollum and his associates[6] identified vitamin D as the antirachitic factor and separated it from vitamin A by passing a stream of oxygen through cod-liver oil held at the temperature of boiling water for from twelve to fourteen hours. Lafayette B. Mendel, whose fundamental works on vitamin A deficiency are well known, considered it quite likely that vitamin A helps indirectly to preserve the physiologic integrity of various epithelial structures and thus to maintain the first line of defense against the invasion of bacteria.

Campbell and Kiefer[7] reported in 1922 that cod-liver oil had a definite inhibitory and bactericidal action on virulent tubercle bacilli. Platono[8] found that unsaturated soaps of cod-liver oil, even in concentrations as low as 0.25 per cent,

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inhibit the growth of tubercle bacilli. Loehr[9] published his bacteriologic study of various fats and oils. He found that bacteria ordinarily encountered in infected wounds, such as streptococci, staphylococci and *Bacillus coli,* die when introduced into cod-liver oil. A subsequent work by Loehr and Treusch[10] showed that this effect of the oil holds true not only of pyogenic micro-organisms, but also of the tubercle bacillus. Iost and Kochergin[11] corroborated the fact that cod-liver oil lowers the vitality of pyogenic bacteria. Tumansky and Yatsevich[12] demonstrated that the growth of streptococci and staphylococci can be stopped in cod-liver oil in one hour and six hours, respectively.

Loehr[9] observed excellent results from the local application of cod-liver oil in burns and fresh industrial wounds, with the exception of wounds badly soiled with earth, highly infected panaritia or areas infected with the gas bacillus. He reported also very satisfactory results from the use of cod-liver oil in acute and chronic osteomyelitis.[13] Drigalski[14] investigated the bactericidal properties of cod-liver oil and found that it inhibits the growth of gas bacilli and spore-forming bacteria.

According to Loehr,[13] the oil in the cod-liver oil ointment is likely to permeate the tissues, causing a rapid liquefaction of necrotic tissues, stimulating to growth the tissues of the involved area and accelerating epithelization. That cod-liver oil is capable of promoting granulation and the development of new epithelium, and thus facilitating the healing of wounds, has been corroborated by several authors. The experimental studies of Davson[15] are of interest. He found that the tissue response to the topical application of cod-liver oil consists of a considerable polymorphonuclear infiltration and active capillary congestion, with infiltration by plasma cells, monocytes and fibroblasts. He found also that the fibroblasts penetrate the tissues deeply and that proliferation of the fibroblasts is associated with a corresponding increase in the capillaries.

REPORT OF CASE

History.—L. I., a white woman, aged 29 years, was admitted to Muirdale Sanatorium January 31, 1938, with a complaint chiefly of severe soreness in the mouth due to ulceration. The patient traced the beginning of the oral symptoms to March 1936. At that time, she was conscious of soreness about the gingival borders of the left upper teeth and the corresponding region of the palate. The condition was diagnosed as Vincent's stomatitis and treated accordingly. In spite of the treatment, the disease was apparently progressing and the peridental areas of the gingivae were destroyed. Another dentist was consulted, and a series of local treatments was instituted. The lesions would temporarily heal and then recur. The next consultant, after the failure of topical treatment, extracted the left upper second molar, at the same time removing a biopsy specimen from the ulcerated area. E. F. Barta, associate professor of pathology, Marquette University, found evidence of tuberculosis on microscopic examination January 22. The patient was advised to enter the sanatorium.

Examination.—The following oral findings were noted on admission: The left cheek was noticeably edematous. The patient preferred to open her mouth and spread the lips herself because of sensitivity of the lesion. There was an ulcer on the upper left side extending from the buccal culdesac over the gingivae to the palate, corresponding in the location to the first and second molars. The lesion measured 2.5 by 1 cm. and had an irregular outline and a punched-out border. The base of the ulcer was filled with patches of granulating tissue. Greenish yellow pus was oozing from its borders at the gingival and buccal reflections.

The physical and roentgenologic examinations of the chest revealed an active far advanced pulmonary tuberculosis involving both lungs.

The tuberculin test was strongly positive and tubercle bacilli were found in the sputum on direct examination. The Wassermann and Kline tests were negative. The red cell sedimentation rate was moderately high.

Blood examination revealed: red blood cells, 5,150,000; hemoglobin, 72 per cent; white blood cells, 14,000. The differential count showed an increased monocyte-lymphocyte ratio.

Treatment and Outcome.—The local treatment of the tuberculous ulcer in the mouth was started February 1 with the application of cotton pledgets soaked in cod-liver oil, an ordinary commercial brand being used. As the oil is always sterile in its natural state, sterilization was not necessary. The applications to the ulcerous area were made every two hours on the first two days of treatment, and from then on every fifteen minutes when the patient was awake.

One week after the institution of this treatment, it was noted that the ulcer was not as pus laden as before and the soreness had begun to diminish. One month later, the ulcerated area appeared to be improving and not so deep as on admission. May 2, the upper left cuspid was removed under intravenous evipae anesthesia. At this time, the entire tuberculous ulcer was filling in with granulation tissue. Two weeks later, in addition to the continued cod-liver oil applications, swabbing of the lesion with 10 per cent silver nitrate solution once a week was started. The cod-liver oil treatment was discontinued when complete healing of the tuberculous ulcer was noted, June 15, four and a half months after the beginning of this treatment. The patient has been under observation until the present date, approximately two years, and the oral lesion has remained completely healed.

SUMMARY AND CONCLUSION

The striking effect of cod-liver oil therapy in this case, together with similar observations in three other cases of oral tuberculosis at this institution during the past three years, seems to signify that natural cod-liver oil contains some potent principle that accelerates the healing of tuberculous ulcers in the mouth. American cod-liver oil contains nine parts of iodine per million. According to the Eleventh Revision of the United States Pharmacopeia, standard medicinal cod-liver oil must have a vitamin A potency of not less than 600 U.S.P. units per gram and a vitamin D potency of not less than 85 U.S.P. units per gram. We are of the opinion that the therapeutically effective fraction of cod-liver oil is vitamin A or a hitherto unidentified factor closely associated with vitamin A.

Our results with the topical application of cod-liver oil in oral tuberculosis are encouraging enough to invite further study of this new method of treatment.

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THE CLEVELAND CENTENNIAL OF AMERICAN DENTISTRY

QUITE appropriately, the Eighty-Second Annual Meeting of the American Dental Association, held in Cleveland, September 9 to 13, was dedicated to the celebration of the one-hundredth anniversary of the organization of dentistry as an autonomous profession.

Fittingly, then, the theme of the Cleveland meeting was historical and many of the features of the meeting were attuned to the centenary keynote of the year. The response of the membership to the invitation from the profession of Cleveland was eminently satisfactory and, altogether, the Cleveland meeting marked another epochal milestone in the progress of dentistry. The year 1940 has certainly been a gala year for dentistry, and the recent meeting was only one of the commemorative occasions signalizing the remarkable progress that dentistry has made in its one hundred years of existence.

Second only in importance as a feature of the occasion were the steps taken in preparation for dental preparedness in anticipation of such a need in these uncertain times. Through the official body of the Association, dentistry has indicated its desire and even eagerness to afford to the Government every facility for promotion of the dental health of the

military arm of defense. By action of the House of Delegates, a committee was appointed and delegated to promote the dental service of the Army and Navy Corps, and thus the Association has offered to the Government full cooperation in any of its activities in war on in peace.

As supplemental to the appointment of this committee and as an earnest of good faith on the part of the organized profession in the support of this and other activities of the Association, the House of Delegates almost unanimously adopted the resolution to increase the membership dues. This is an action that we heartily applaud because of a firm conviction that dentistry cannot go forward toward the full accomplishment of its health mission on the financial support afforded by the present membership dues. Now, however, at the threshold of new and increasing demands upon the organization, we can, in some measure, meet the health obligations toward the public and toward the Government which the organized profession has taken upon itself; and more particularly, toward the latter, in view of the favorable attitude which the legislative branches of the Government have expressed in the consideration of an appropriation to promote and aid the scientific investigation of and attempts to solve many of our dental problems. We believe that such provision for and encouragement of professional activity is an economic safeguard for the community and one that promises large health returns for the future.

Then, too, in this time when we are more definitely determining the future status of dentistry as a separate and autonomous profession, it is of immense importance to have the element of support and encouragement toward permanency and independence that such governmental approval affords, and the Association is much indebted to the National Health Program Committee and its chairman, Dr. Oppice, for arousing an interest in dental health service that has led to the consideration of the legislation mentioned. Truly, " 'Tis an ill wind that blows nobody any good," and in this instance, in all probability, the war disturbances of Europe may reflexly result in an action on the part of the Government that will redound to the good of the dental profession.

The completion of the personnel of the Council on Dental Education as an actively functioning body was an incident of the meeting that promises rapid and substantial advance in the coordination of the Association's interests in the educational field. The immediate course and manner of development of dental education will have a most important part in determining the future character of dentistry and its relation to general health service. One of the difficult problems in den-

tistry today, and one that the Council has taken steps to solve, is the coordination of educational and licensing bodies. The Council has been fortunate in interesting Dr. Harlan H. Horner, formerly associate commissioner of education of the State of New York in our educational activity to the extent of becoming its executive secretary, and we look forward most hopefully to the solution of many of our educational problems through this happy association.

Incidentally, and as an interest vitally involved in our educational problems, we are pleased indeed to note the return of the National Association of Dental Examiners to the American Dental Association educational fold. As the result of the indefatigable efforts of the National Board of Dental Examiners, the National Association of Dental Examiners is now again represented on the National Board of Dental Examiners and we expect much progress in the early future toward the promotion of the reciprocal licensing motive of the latter body.

The outstanding and most enjoyable feature of the meeting, to the writer at least, was the complimentary luncheon to Dr. Harvey J. Burkhart on Tuesday, September 10, a fitting and well-deserved honor to one to whom organized dentistry owes much. Presided over by Dr. Don M. Gallie, a life-long associate and friend of Dr. Burkhart, the luncheon proved to be an affair that brought delight to every one present in the tributes of respect, admiration and friendship in words that left no doubt as to their sincerity. Harvey Burkhart has through a period of more than forty years been a faithful, loyal and capable leader of dentistry. He has given time, energy and effort to the upbuilding of organized dentistry and has lived to see the effective and abundantly beneficial results thereof. Dentistry has given to Dr. Burkhart almost every honor within its power, but none we are sure has been more highly appreciated than this one, by him as well as by his gracious and lovable wife.

The scientific phase of the meeting was of the highest character and much was contributed toward the solution of our many problems. The Section meetings were all well attended and a lively interest was manifested in every phase of dental practice. The one thing that surprised but pleased us most was the large attendance at the sessions of the Section on Operative Dentistry, and we were inclined to interpret it as indicative of a revival of interest in a phase of dentistry that in late years has seemed to take a subordinate place in the practice of dentistry.

The accommodations for the Sections were ideal; in fact, the Cleveland auditorium is as well adapted to the American Dental Associa-

tion's convention needs as the accommodations in any city in which we meet. Every phase of the meeting was amply accommodated, with room to spare. The General Sessions were well attended, and Dr. Merritt's policy of having non-scientific addresses, or rather only addresses of interest to the public, at the general sessions seemed to be a happy inspiration.

Of more than usual interest was the scientific exhibition; the lively interest in this Exhibition being enhanced by the excellent work done by Dr. George B. Winter in organizing and promoting this activity.

A particularly pleasing feature of the meeting was the gracious, dignified and gentlemanly manner in which our genial President, Dr. Merritt, presided over the various audiences of the meetings. In a most capable, efficient and agreeable manner, he rounded out at Cleveland his tenure of the presidency as he conducted the office throughout his administration. Dr. Merritt has set a new standard for the presidency. He has served the Association well and most creditably. He has added dignity to capability in his administration, leaving a notable record, and one that has shed much credit on dentistry.

Wilfred H. Robinson, Oakland, Calif., succeeds Dr. Merritt as President and Oren A. Oliver of Nashville, Tenn., was made President Elect. J. V. Gentilly, of Cleveland, was elected First Vice-President; S. Blair Luckie, Chester, Pa., Second Vice-President, and Frank C. Cady, Washington, D. C., Third Vice-President. Harry B. Pinney was re-elected Secretary and R. H. Volland, Treasurer.

Houston, Texas, was selected as the next place of meeting.

The Local Committee on Arrangements under the efficient chairmanship of Dr. Gentilly, left nothing undone toward the comfort, pleasure, entertainment and edification of the nearly nine thousand who attended the meeting. Altogether, the Cleveland Meeting takes its place in dental history as one of the most successful meetings of the Association.

DEATH OF DR. CHARLES D. COLE

IT is with much sadness that we announce the death of Dr. Charles D. Cole, of Washington, D. C., Vice-Chairman of the Committee on Dental Legislation of the American Dental Association, which occurred in the airplane disaster at Lovettsville, Va., August 31.

An obituary notice of Dr. Cole will appear in an early issue of THE JOURNAL.

BIBLIOGRAPHICAL

The Contribution of the Eastern Association of Graduates of the Angle School of Orthodontia to the Science and Practice of Orthodontia

Paper. 139 pages. Price $2.00. Published by the Eastern Association of Graduates of the Angle School of Orthodontia, New York, 1939.

As the title suggests, this is a compilation of certain of the outstanding papers representing original work published by various members of the Eastern Association of Graduates of the Angle School of Orthodontia. One cannot help being impressed with the roster of the names of leading practitioners of the specialty of orthodontia who acquired their training through association with Dr. Angle at a time when universities lagged behind private enterprise. The scientific articles reproduced in this little volume are outstanding examples of the type of work fostered by the Angle graduates. The volume will be of interest in addition to all those who are interested in the history of the development of orthodontia as a graduate dental specialty and the rôle played by the Angle association in this development.

Operative Dental Surgery

By J. B. Parfitt, L.R.C.P., M.R.C.S., L.D.S., Consulting Dental Surgeon and Late Lecturer on Operative Dental Surgery at Guy's Hospital Dental School, and W. E. Herbert, L.R.C.P., M.R.C.S., L.D.S., Professor of Dental Surgery, University of London at Guy's Hospital Dental School. Fourth edition. Cloth. 477 pages with 194 illustrations. Baltimore: The Williams and Wilkins Company, 1939.

This English textbook covers succinctly the clinical phases of operative densitry, root-canal work and certain porcelain and metallic crowns and concludes with a short chapter on the extraction of teeth. In other words, the book is a compendium of dental procedures except for the larger prosthetic restorations. The text is nicely written and illustrated. For this reason, it should make a useful textbook for students whose work in operative dentistry is supplemented by additional lecture material. However, as with most foreign textbooks, certain clinical practices described differ so widely from those in common usage in this country that the usefulness of this volume for student work is greatly curtailed. For additional reading, or for general information on English operative methods, the volume should prove of interest.

Cyclopropane Anesthesia

By R. H. Robbins, B.A., M.S., M.D., Associate Professor of Pharmacology, Vanderbilt University, School of Medicine. Cloth. 175 pages. Price $3.00. The Williams and Wilkins Company, Baltimore, 1940.

Professor Robbins presents, in this small volume, the results of a tremendous amount of experimental work on the new anesthetic agent cyclopropane. In addition to his own research work, that of other investigators is presented and evaluated. The result of this effort is to present a comprehensive coordinated account which forms an entirely adequate basis for the understanding of the pharmacology and the physiologic effects of this anesthetic gas. This volume should do much to bring about universal approval of cyclopropane as the ideal anesthetic agent.

A Textbook of Exodontia

By Leo Winter, M.D., D.D.S., F.A.C.D., Sc.D. (Hon.), LL.D. Professor of Oral Surgery, New York University; Director of the Oral and Minor Surgery Clinic, New York University, College of Dentistry; Visiting Dental Surgeon in Charge, Bellevue Hospital, Etc. Fourth Edition. Cloth. 520 pp. with 475 illustrations. Price $10.00. The C. V. Mosby Company. St. Louis, 1940.

This well-known textbook has again been revised to include more recent information. A new chapter on general anesthesia by E. S. Rovenstine briefly describes the objectives and technics of inhalation anesthesia. The chapter on pericoronal infection has been completely revised and rewritten, and a

new short and rather inadequate discussion of sulfanilamide has been included in the text. Otherwise, the volume remains very much the same. The author discusses fully local anesthetics and their methods of administration. The greater portion of the book is concerned with methods of extracting teeth, both simple and difficult extractions being fully considered. The section on impacted teeth and their removal, which covers 160 pages, is fully illustrated. There is a short chapter on fractures of the jaws, and the volume closes with a brief description of jaw cysts and methods of treating them. The whole text is well written and is profusely illustrated with roentgenograms and drawings presenting the various operative procedures discussed. This volume should prove to be a most acceptable textbook and reference work for students and practitioners.

OBITUARIES

MARY H. WESTFALL, D.D.S.
1881-1940

MARY H. WESTFALL, a nationally recognized leader in children's dentistry and educational oral hygiene, died at the Methodist Hospital in Indianapolis, Ind., August 4, after an illness of several months.

Dr. Westfall was born in Bushnell, Ill., February 28, 1881. She was graduated from the dental school of Northwestern University in 1917. In recognition of her high scholastic standing, she was made a member of the honorary dental fraternity, Omicron Kappa Upsilon. After graduation, she began the practice of children's dentistry in Indianapolis, where she practiced until being appointed Indiana State educational director for the Good Teeth Council for Children, Inc., of Chicago.

Dr. Westfall was a member of the Indiana State Dental Association, American Public Health Association, American Dental Association and American Association of Public Health Dentists. She was chairman of the Education and Oral Hygiene Committee of the Indiana State Dental Association and chairman of the Visual Education Committee of the American Association of Public Health Dentists.

Since 1936, she had been on the staff of the Bureau of Maternal-Child-Health of the Indiana State Board of Health as dental health educator. In this work, she made state-wide contacts enabling her to interest organizations, sororities, parent-teacher units and other groups in financing dental repair work for needy children.

MARY H. WESTFALL, D.D.S.

Dr. Westfall's exceptional personality drew to her many friends wherever she went, and those friends knew her as a straight thinker and a tireless worker for the advancement of her profession.

With the feeling that children's den-

tistry had been slighted, she was constantly doing her part in educating the profession, the mothers and the children to a better dental health service for children.

Her first big opportunity for this type of educational work came when she became Indiana state educational director for the Good Teeth Council. In this capacity, she became known to the profession throughout the country as a child health enthusiast.

Dr. Mary, as she was affectionately known to thousands of children as well as dentists all over the country, was an inspiration to every one who knew her. The profession has lost an enthusiastic and valuable member.

Surviving are two brothers, Curtis C. Westfall, Chicago, and Dr. B. K. Westfall, Indianapolis, president of the Indiana State Dental Association.

J. B. CARR.

ALEXANDER BRAGG HORN, D.D.S.

1875-1940

ALEXANDER BRAGG HORN was born in Uniontown, Ala., August 14, 1875. He completed his education at Birmingham Dental College and practiced in Clanton and Union Springs before he moved to Montgomery, where he practiced from 1921 until his death.

Bragg Horn's admirable qualities were as much of genetic origin as of environmental influence. As a direct descendant of Governor Bragg, one of Alabama's most famous statesmen, he displayed much of the same sterling quality of citizenship as his distinguished ancestor.

As a friend he had no superior. His profession was dentistry, and in his passing, dentistry has lost one of its most devoted and loyal practitioners—one of its most ardent supporters.

Bragg Horn is dead; but he still lives, and he will live as long as the tide ebbs and flows. His example, his associations, his contacts, his daily influence, all for the betterment of mankind, will be as a pebble cast into the water to move in ever widening circles.

Aside from wide dental activity, in which he performed a notable work in securing favorable legislation for the benefit of dentistry, Dr. Horn was a member of the Masonic and Scottish Rites bodies, the Silver Leaf Camp and Woodmen of the World. He was twice elected state leader of the Woodmen and was at one time a member of its national law committee.

Surviving are the widow, Mrs. Rosa McKay Horn; a daughter, Mrs. John Burns Paterson; a sister, Mrs. William Marsh, of Montgomery, and two grandchildren.

Bragg Horn died August 16, but his ideals and the results of his efforts will live on.

CHARLES F. CHANDLER.

L. WALLACE OHL, D.D.S.

L. WALLACE OHL, of Ingram, Pa., died of a heart attack at his home on July 11, 1940.

Born in Ingram, he graduated from the public and high schools there, and from the University of Pittsburgh Dental School in 1911. He held the chair of anesthesia and exodontia at the university for eighteen years and was an excellent teacher and clinician. He was instrumental in establishing the dental department in the West Penn Hospital, where he was a member of the major staff.

Dr. Ohl was a member of the honorary dental fraternity Omicron Kappa Upsilon and of the social fraternity Psi Omega. He appeared before many state and local organizations and was among the first to use moving pictures in connection with his lectures on oral surgery and exodontia. He was a member of the Odontological Society of Western Pennsylvania, Pennsylvania State Dental Society and American Dental Association, and had been a Fellow of the International College of Dentists since 1938.

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COMMITTEE ON DENTAL PREPAREDNESS

IT was evident to those present at the Eighty-Second Annual Meeting of the American Dental Association in Cleveland that dental preparedness is one of the most important questions facing the profession today.

Several months ago, at the request of governmental agencies, President Merritt appointed a committee on dental preparedness from the membership of the American Dental Association to act with these agencies in such a manner as to best serve the dental needs of the armed forces of the nation and at the same time to preserve the dental services so important to the public as a whole. After months of planning, the work of the committee was brought before the House of Delegates and, after deliberation, the recommendations of the committee were approved and it was instructed to proceed with the outlined program.

The most important recommendation was one to the effect that a questionnaire be sent from the American Dental Association to every practicing dentist in the United States and its possessions. The results obtained from this questionnaire will enable the Government to utilize the dental man power of our country in such a way as to best serve the country, the public and the profession.

This questionnaire will be mailed from the Central Office in Chicago within a very short time, and each dentist is urged to cooperate wholeheartedly in this important move. For cooperation to the fullest extent, the questionnaire should be completed and returned the day that it is received. If for any reason a questionnaire does not reach you or in case the one you receive should be marred in your attempt to complete it, another will be sent to you immediately upon a request sent to the American Dental Association, Committee on Dental Preparedness, 212 East Superior Street, Chicago, Ill.

On the basis of the results from these questionnaires, every effort will be made to supply the needs of the armed forces of the nation without disturbing the practices of those men who have been established over a period of years. If, however, sufficient volunteers are not forthcoming, then and only then will it be necessary to conscript men to fill the necessary posts.

Early in the deliberations of the Committee on Dental Preparedness, it was decided to request each state society to appoint a military affairs committee. This has been done and there now exists in each state such a committee. Through these various committees, it will be possible to better administer the duties which will fall on the American Dental Association because of requests made by the Government.

One of the most important parts of the preparedness program is approaching completion and will be ready for release to the profession in a short time. This is the preparation of an outline for the study of military dentistry which will be adaptable for study club programs. Thus, those men who are not serving in the actual armed forces may better equip themselves to serve in case a dire emergency should arise.

Dentistry has always exerted every effort to meet the responsibilities of the day and here again finds itself in a position to be of great service to the country and the people. The success of each effort has been due to the interest of each member of the profession, and here again we face responsibility with the assurance that when the page is finished, dentistry will be proud of its record.

The Committee on Dental Prepared-

ness is made up of the following: Clarence G. Brooks, New London, Conn., Edward H. Bruening, Omaha, Nebr., Henry O. Lineberger, Raleigh, N. C., John T. O'Rourke, Louisville, Ky., J. Ben Robinson, Baltimore, Md., Leuman M. Waugh, New York, N. Y., C. Willard Camalier, Chairman, Washington, D. C., and Gerald D. Timmons, Secretary, 212 E. Superior St., Chicago, Ill.

HIGHLIGHTS OF THE CLEVELAND MEETING

THE centennial convention brought together in Cleveland almost 9,000 members of the profession, in a meeting successful from every point of view. In spite of the large attendance, which taxed hotel accommodations, facilities were in all cases ample, for both the professional and the social programs.

The Cleveland Public Auditorium made an excellent setting for the many exhibits, which occupied two large halls —the entire arena floor. General sessions and section meetings were also held in the Auditorium, and were conducted on schedule, with the assistance of an adequate and efficient staff of attendants, and the clerical and information personnel.

The convention's dominant theme, recurrent in the addresses of the Association's officers and distinguished guest speakers, was national defense and the dental profession's special rôle in it.

This theme found its first major expression, perhaps, in the report of the Committee on Economics to the House of Delegates, which met in the Euclid Ballroom of the Hotel Statler. The report presented preliminary figures from a nation wide dental health census, conducted by the Committee on Economics, showing that, in the words of C. Willard Camalier, of Washington, D. C., chairman of the Committee on Dental Preparedness, "the nation, from a dental standpoint, is woefully unprepared to meet the exacting requirements in industry and the military services in a time of possible national emergency."

Raymond M. Walls, of Bethlehem, Pa., concurred in this interpretation of the figures. Dr. Walls, as chairman of the Committee on Economics, supervised the census and presented the report to the House of Delegates.

The census, the first survey of its kind ever attempted, was designed to secure an adequate cross-section of the population's dental needs. Thirteen thousand dentists throughout the country received 65,000 questionnaires.

Computation, at the time the first figures were released, was far from complete, Dr. Walls told the House of Delegates; "but," he added, "after careful consideration of the figures now available, we must face the fact that an immediate effort must be made by dentistry to meet a situation which may have a serious effect on the whole defense program."

Dr. Walls and Dr. Camalier made it clear that their conclusions did not apply solely to the needs of those subject to military service, but also to the needs of the civilian population. In a statement issued to the newspapers, Dr. Camalier said:

"From an immediate military standpoint alone, if 1,000,000 men between the ages of 20 and 44 were drawn tomorrow from the civilian population, we estimate that 7,023,900 hours of dental service would be necessary to make them dentally fit. Of course, in such an event, dental requirements for admission would probably be lowered, but the efficiency of the men accepted would also be lowered, perhaps in direct proportion."

The convention's emphasis on national

defense had been anticipated in messages received early in the convention from President Roosevelt and Wendell L. Willkie, both of whom expressed appreciation of the A. D. A.'s readiness to cooperate in the defense program.

Both messages also contained high tribute to the achievements of dentistry on the occasion of its centenary, as did a message from Nathan B. Van Etten, president of the American Medical Association.

In his official address to the convention's first general session, Arthur H. Merritt, the retiring President, also touched on the defense program, though more indirectly, and as part of the grave responsibilities of our troubled era.

Dr. Merritt outlined a three-point program for American dentistry as it enters its second century of service—a program of research, public education and care of the indigent by the state.

"This is the only logical approach," he said, "to a problem which, at some time in life, touches every man, woman and child in this country. It represents one of the major health issues of this generation and is so regarded by many thoughtful persons concerned with the health of the nation."

Dr. Wilfred H. Robinson, on receiving the gavel from Dr. Merritt at the convention's close, reiterated the profession's willingness to aid the national defense program, but stressed the fact that civilian needs must be met as well.

On the basis of the report of the Committee on Economics on the dental health census, and drawing upon the experience in the last war regarding dental health in industry and the army, the House of Delegates adopted a three-point program for mobilization of America's dental resources to aid in national defense.

The program, recommended by the national defense committee, calls for:

1. Sending to every registered dentist in the nation a questionnaire giving complete information on the dental personnel available for military purposes and for civilian needs.

2. Launching a program for cooperation with the Surgeons General of the Army and Navy to reduce the percentage of rejections for dental defects among volunteers and prospective draftees under the conscription law.

3. Setting in motion a special education program for dentists by distributing courses in military dentistry, now under preparation by the War Department.

The report and recommendations of the preparedness committee were presented to the House of Delegates by Dr. Camalier. The report outlined the work of the committee in the nine months preceding the convention, during which its members were in close contact with members of Congress, heads of federal agencies, the American Red Cross and the National Youth Administration, as well as Army and Navy officials.

A motion for a two dollar raise in dues, a matter which has been under consideration for the past two years, was adopted by a unanimous vote of the House of Delegates.

The first general session of the convention was addressed by Senator James E. Murray of Montana, who said that a sound national dental program must be designed as an essential part of any national health program. Senator Murray, almost simultaneously with the passing in the Senate of his bill calling for subsidizing of dental research, paid the profession glowing tribute. He said of dentistry: "In very recent years, it has lifted itself from a vocation to a major profession. It has transformed its educational standards and has associated itself with the main currents of science and education."

The invocation at the opening session was given by the Rev. Dilworth Lupton, of the First Unitarian Church in Cleveland. The Rev. Norman Vincent Peale, of New York City, well-known as a radio

speaker, read an inspirational address on "The Art of Living."

Two other guest speakers were Earnest Albert Hooton, renowned anthropologist, of Harvard University, and Frederic Snyder, news analyst, of Kingston, N. Y.

Mr. Snyder spoke on "Our Views and the Hour's News," at the second general session. He predicted, in highly moving language, that the final victors in the present European war will be the nations that exhibit the most character, not the most guns.

Dr. Hooton, speaking at the third general session, linked forms of government with biologic change. He stated that the present-day poor quality of human teeth is not an isolated phenomenon, but reflects a larger degeneration seen at its worst in the totalitarian states of Europe.

Witty and discursive, Dr. Hooton at the same time had a serious message to convey in his speech. He urged upon both the dental and the medical profession a program of research into the pathology of dental decay and other diseases of the mouth. He made it clear that he considered the provinces of the two professions already well-defined, with the autonomy of each thoroughly established.

In the general sessions, sectional meetings, motion pictures, programs of associated dental groups, clinics and exhibits, the convention presented a panorama of dentistry's past, present and future.

A notable occasion of the convention week took place Tuesday, September 10, the entire day being set aside as "Harvey J. Burkhart Day," in honor of Dr. Burkhart, director of the Rochester, N. Y. Dental Dispensary and of the Eastman Clinics in Europe. Dr. Burkhart, the acknowledged dean of American dentists, was feted at a luncheon in the Hotel Statler, attended by more than a thousand colleagues and friends.

At a luncheon for the House of Delegates Monday, September 9, Frederick C. Waite, of Cleveland, spoke on Ohio's contributions to the progress of American Dentistry.

On Monday, too, the American Society for the Promotion of Dentistry for Children held a luncheon, at which Walter T. McFall, of Asheville, N. C. spoke on "Dividends for the Future."

The President's Ball, held Wednesday evening in the Grand Ballroom of the Hotel Statler, provided the climax of the convention's extensive social program. Beginning with a dinner, the evening was devoted to music, dancing and good fellowship. It included a floor show remarkable for the variety of talent displayed.

Highlights of the Women's Program included a luncheon and style show in the Grand Ballroom of the Statler and a three-hour cruise on Lake Erie.

The scientific and health exhibits in the arena of the Public Auditorium were open to the public. There were 243 exhibits in all, with public interest centering on the exhibits on national defense and on the dental history of the Dionne quintuplets, brought from Canada by the quints' own dentist, Dr. Arnold D. Mason, dean of the dental faculty at the University of Toronto. Outstanding also were the historical exhibits.

The Maryland State Dental Association was given the first award among the historical exhibits. This exhibit, arranged by J. Ben Robinson, dean of the Baltimore College of Dental Surgery, division of the University of Maryland, showed American dental progress through historical documents, textbooks, and a wealth of material about early dentists.

The Dental School of the University of Pittsburgh was awarded the second prize in this division and the third prize went to Northwestern University.

Among scientific exhibits of schools, the first award was made to Western Reserve University, Bolton Fund; sec-

ond, University of California College of Dentistry; and third, University of Michigan School of Dentistry, with honorable mention to Temple University School of Dentistry.

A woman dentist of Philadelphia, Dorothy B. Waugh, won first award in the division of individual scientific exhibits. Her exhibit consisted of sculptured specimens of esthetic facial designs and of malformations and diseased tissues of the face.

Two other Philadelphians, in a joint display, took second award—G. M. Dorrance, professor of oral surgery at the University of Pennsylvania Dental School, and Arthur Dick, associated with Dr. Dorrance. The third award went to E. E. Taylor, of Denver, Colo., who exhibited examples of work in restorative dentistry.

The Cleveland Child Health Association won first place in the Health Exhibit Class. Walter E. Briggs of Attleboro, Mass., won second place; the Tennessee State Department of Public Health, third place, and the Missouri State Department of Health, Dental Division won honorable mention.

Cleveland dentists who won awards for displays of their hobbies were: first, Bernie Cooper, who showed masks of hammered copper, ceramics and woodcarving; second, Howard A. Hartman, with a collection of photographs of celebrities; third, W. H. Goodwin, who exhibited soap carvings. Honorable mention went to J. V. Gentilly, for an exhibit of a sculptured bust.

The 165 booths displaying the technical exhibits of manufacturers and dealers completely filled the immense Exhibit Hall in the lower level of the Auditorium. In spite of its spaciousness, the technical exhibit section was crowded most of the time.

Broadcasts on two national hookups took place during convention week. Sunday, September 8, over the Blue Network of NBC, a dramatized history of dentistry was presented, closing with a message from Cleveland by Dr. Merritt. Thursday, over CBS, Dr. Merritt and Dr. Camalier discussed the A. D. A. program to aid in national defense. In addition, eight broadcasts featuring the convention were made over Cleveland stations throughout the week.

The appropriation of $23,000, an increase of $6,000 over last year's appropriation, includes $5,000 which will go to the establishment of a fellowship in dental research at the National Institute of Health, Washington, D. C., the research arm of the U. S. Public Health Service.

In the last session of the House of Delegates on Thursday, Oren A. Oliver, orthodontist, of Nashville, Tenn., was chosen President-Elect. Other officials elected are:

James V. Gentilly, of Cleveland, First Vice President; S. Blair Luckie, of Chester, Pa., Second Vice President; and Frank C. Cady of Washington, D. C., senior dental surgeon in the U. S. Public Health Service, Third Vice President.

R. H. Volland, of Iowa City, Iowa, was reelected treasurer; and Harry B. Pinney was reelected secretary. Philip E. Adams, of Boston, was reelected Trustee. Other Trustees chosen are: Howard E. Summers, Huntington, W. Va.; Carlos H. Schott, Cincinnati, and H. B. Washburn, St. Paul, Minn.

Dr. Gentilly and the Local Arrangements Committee, of which he was chairman, performed their manifold tasks with the utmost efficiency.

The publicity committee received excellent cooperation from the press. Reporting of the convention by the papers was dignified and thorough. The well-displayed daily accounts, as well as numerous pictures of the social and scientific highlights of the convention, maintained wide public interest in the convention.

Houston, Texas, was selected for next year's convention city.

BUREAU OF PUBLIC RELATIONS

CONDUCTING A STATE-WIDE HEALTH EDUCATIONAL PROGRAM

By Richard C. Leonard, D.D.S., Baltimore, Md.

DENTAL health education projects (Federal, state, community or otherwise) should have dentists as their directors. Just as a medical service should be headed by a physician, a nursing service by a nurse, a bacteriologic laboratory by a bacteriologist, etc., a dental service should have as its head a qualified doctor of dental surgery.

The dentist director of a project and all of the program's personnel should have a background of experience in the public health field or should have specialized postgraduate training in both the pertinent matter of their own public health activity and in the concepts of public health work as a whole.

Mere knowledge of dental facts and the technical ability to render corrective care will not suffice in the administration of a dental health education program. There must be the understanding of ways and means of successfully disseminating dental health facts, appreciation of the media employed, correlation of dental health problems with other branches of public health service and the ability to utilize available means and methods.

While not 100 per cent essential, it is desirable that dental health education projects be given an entirely autonomous status in the state department of which it is a part.

In this regard, it may be conceded that numerous dental health projects rather than being separate divisions, are subdivisions of one or another bureau, usually of a medically directed bureau of maternal and child health. But, successful as such subordination may have been, the distinct problem involved in dental health makes separation from other bureaus desirable, although close cooperation with all other bureaus *must* be a constant aim, and the status of dentistry as a profession is bettered in the public eye by its being placed on a separate and an equal plane with other branches of health service.

The dental health education program should include the willing service of every ethical practitioner in the state. By service, not mere lip devotion or endorsement is meant, but the bona fide effort to promote the program in every possible way—by giving talks to lay groups, by talking to patients, by cooperating in school dental examinations and, most important, by practicing the principles of preventive dentistry.

The program should include training of normal-school students in the rudimentary facts of oral hygiene and in the aims of the dental health education project.

If an educational project is to succeed, there must be employed as propagandists

Read before the Section on Children's Dentistry and Oral Hygiene at the Eighty-First Annual Session of the American Dental Association, Milwaukee, Wis., July 19, 1939.

more than the usual handful of dentists who are actually endowed with teaching experience or ability. Moreover, no group is in such constant contact with a large mass of lay persons as are the teachers of the public and parochial schools. If they can be trained and interested in our special problem in health education, the most valuable asset possible to the success of the project is ours.

There must be developed a collection of educational material that is at once dentally sound and pedagogically adapted for use in the instruction of every age group from the preschool child to the mature adult.

In this expression of belief, there is no intentional condemnation of all the material now available. Some of this material is excellent, some good, some very poor. But there is not a complete selection for varying age groups or for varying types of pedagogic approach; nor is the material adaptable to the varying conditions found when one attempts a state-wide dental health educational program. The development of satisfactory, comprehensive teaching material is the duty of the dental profession, assisted by a qualified educator.

In this regard, it should be stated that the American Dental Association now has under consideration the employment of an educator to aid in the development of the needed educational material.

As school children offer the best opportunity for education, the major effort of an educational project should be made in the public and parochial schools. This statement needs no support. It is obvious that in the schools there is a greater opportunity to reach a large group of lay persons who are at the most mentally receptive stage of life.

The education of non-school groups cannot be entirely ignored. In other words, dental health in the concept of prevention alone may center around children and practicality may demand the specified emphasis in their training, but, to quote an eminent educator, Joseph Kinmont Hart, in "Adult Education":

> It is not the education of the child that can save the world from destruction; it is the education of adults. It is the adult who must be released from his narrow-mindedness, his prejudices, his outworn customs and his obsolete habits.

So, in the endeavor to educate the children in the hope that some, if not all, of them will carry the training through to adulthood, the present generation of adults cannot be entirely forgotten.

While there should be a careful review of the success attained by the various efforts toward education of the public, and subsequent emphasis should be placed on those efforts seemingly the most productive, one should never scorn what seems to be an inconsequential attempt to reach a group of the laity. I recall my own misgivings as to the value of giving a health talk to a group of school bus drivers, but their support, voiced to parents of rural home children, swung public sentiment into line in support of the projected program.

Every possible method should be employed in the dissemination of dental health facts. The public press, radio, motion pictures, lay lectures, class room study—these and many others are methods that, all based on authentic facts, may serve as media for the spreading of information on our phase of health education.

The financing of any state program is too much of a local problem to make feasible any generalizations in this presentation. It may be stated, however, that as the education of its people is the duty of any government, their enlightenment as to facts regarding the health of their mouths should be financed by any or all governmental agencies. The use of funds from private or philanthropic sources is, of course, entirely proper. But every program should enjoy the certainty of permanence that accompanies a fixed

governmental policy of inclusion of funds for health education in annual budgets.

A state-wide dental health education program must include the education of the dental profession itself. By education in this respect, I mean either the persuasion to apply already acquired knowledge or the actual enlightening of dental practitioners on the latest developments in the field of preventive dentistry.

In states wherein dental schools are located, there should be close cooperation between the sponsors of the dental educational project and the school itself. Many schools now include courses not only in preventive dentistry, but also on other aspects of public health. The dental graduate of today should be interested not merely in dental health, but also in public health.

The older established practitioner offers more difficulty than the undergraduate; but he too may be reached and made a far more vital part of the state dental health program through the agency of refresher courses conducted as an important part of the educational project.

State-wide dental educational programs should begin and always be coordinated with the dental profession.

2411 North Charles Street.

PROBLEMS CONFRONTING SCHOOL DENTAL HEALTH EDUCATION

By HIRAM A. JONES,* Albany, N. Y.

SCORES of educators and dentists alike are today totally unconcerned regarding or unconscious of conditions affecting school dental health and the resulting implications. Those of us present here today and our professional associates back home may well be alarmed at the current conditions which threaten to destroy the very ideals for which both professions have long stood. At best, the present problems confronting school dental health, as is also the case with certain other phases of public education, threaten to prevent the attainment of these ideals.

It is a rather well-known fact that school dental health programs have been fostered in some states for nearly three decades and in some local communities even longer. Yet today, dental defects outnumber by far any other type of physical defect among school children. At the same time, it will be noted that some members of the profession are finding it difficult to make a living. While authorities know that good teeth are essential to good health and that they are a factor in a happy functioning personality, we have yet to convey these facts satisfactorily to the masses of the public.

In this day of social unrest and economic difficulty—at a time when the vote and influence of the man on the street are having a far-reaching effect—"What to do?" is a serious question. Nearly every phase of our social structure is undergoing critical examination. For more reasons than one, therefore, a dis-

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cussion of the problems confronting school dental health education is important.

What are these problems? Some of the major ones are: (1) confusion as to nature, scope and function of the school dental health; (2) public demands for free services; (3) current legislation to meet those demands; (4) economic difficulties and budget cuts affecting school programs, and (5) questions of leadership (both inside and outside the schools).

Let us study these problems. What is the reason for the confusion as to the nature, scope and function of this phase of education? In all probability, the reason for the present situation is the lack of any clear-cut analysis of the primary function of the school with regard to dental health. Neither the teaching profession nor the dental profession seems to have agreed on this program.

Of what should the school dental program consist? Some authorities hold that this is a service program designed to discover defects, notify parents and make corrections, either through school facilities or otherwise. In such a program, obviously, the school dentist in actual practice is in competition with the private practitioner. In this sort of program, the school becomes a clinic as far as dental health is concerned, and the teaching process is given little, if any, consideration. The school's function, as a broader educational effort, is virtually ignored.

This conception of the school dental program represents loose thinking, or a lack of thinking, on the part of those responsible for its administration. It shows also a lack of understanding of the true functions of various responsible social agencies, including the home and the private dentist. Strangely enough, however, this type of program finds considerable support among educators and dentists alike.

Other authorities hold that the school dental program is one of prevention. The exact meaning of the term "prevention" is not always clear. "Prevention," as thus conceived by some professional groups, appears to be related in most cases to clinical procedures. Its nature seems related more to correction than to a positive, developmental program of child activity which would lead to sound dental health. "Prevention" as developed through education should reflect the latter. This program in the schools today must be based on sound educational practice. It must consist of a maximum of child activity and a minimum of adult activity. It must include primarily those things which the child does for himself under guidance, and a minimum of those things which are done by adults for him. The child must eventually emerge as one prepared to take the responsibility for his own dental health, if the program is to be successful.

Children develop good dental health habits and skill through practicing such habits. The dentist, in filling teeth, and the dental hygiene teacher, in cleaning them, contribute to, but do not necessarily insure, improved dental health behavior in the child. Likewise, filling or cleaning the child's teeth once or twice or even a dozen times, without charge, does not guarantee that later he or his parents will assume the responsibility of having this service done. Would it not be equally absurd for the teacher to solve all of the child's arithmetic problems and to hope that thereby he would somehow "catch on" so that by the time he grew up and received a pay envelope, he would know how to add and subtract? Even home calls, which secure immediate correction of dental defects, do not alone solve the problem.

The imparting of the best modern knowledge concerning the care of teeth and the guidance of children in the development of desirable dental health habits is, and must be, the prime function of the dental health education programs in the schools. Furthermore, it should

be remembered at all times that it takes continuous practice to form a habit or to acquire skill. Thus, the teaching of dental health must be continuous. Moreover, we should be reminded that to influence child behavior requires more than dental knowledge and dental technic. It calls primarily for skill in guiding children in the learning process.

It is also of extreme importance that, in our efforts to develop sound mouth health in the child, we view him as a whole organism, composed of a number of integral parts, and not just as a mouth full of teeth. His instruction in oral hygiene should be given in proper perspective with his needs for proper instruction along other lines. The educational programs of this age of specialization are replete with failures to reach the goal because of the overenthusiasm of specialists who fail to view the child as a whole. One may be interested in his feet; another in his eyes; another in his ears; still another in his spine. Some one else may be interested in his tonsils; yet another in his heart beat. Again, the specialist in mathematics may be the difficulty, or another specialist may be overconcerned about his football technic.

While all of these specialists have been pulling the boy apart, his mother and father may be home praying that somehow or other he may be reassembled and emerge as a whole. That specialization is important and that specialists are essential to the school staff, no one will deny, but to permit them to proceed without coordination may defeat the purpose for which they are maintained.

If the school, with the funds at its command, performs first of all its primary function in dental health, i.e., that of teaching, and, except in emergency, excludes from its function the treatment of any defects, it will find that it has a task of first magnitude; and if the other agencies, such as the home and the departments of welfare, assume the responsibilities which are legally theirs, much less confusion will exist.

The second problem cited above, that is, public demand for free service, is one that promises to be very difficult. The public of today is securing the largest return ever had from public service and is crying for more. Moreover, people in growing numbers seem to be expecting these services for little or nothing. The social dangers of this spirit of the times seem self-evident. It appears doubtful whether any political party will be able to satisfy this demand and survive. This condition surely represents a problem of major concern and its implications are far reaching. Dentistry, as well as education, cannot afford to sit idly by while newer solutions to this problem are being found.

To meet the public demands just cited, current legislation is providing new and increasing service. Money is being spent in increasing quantities to meet public needs adequately. With these worth while efforts to serve the needy, dangerous procedures creep in. Old policies give way to new ones. At best, there is a struggle to maintain the right sort of direction; and, certainly, where to begin and where to stop is no small problem. While a considerable amount of money, through social security, has found its way into facilities for public dental service, it is significant to note that none of these funds to date have been allocated through departments of education. At the present time, movements are well under way to provide greater federal aid for health services, including dental health, both through departments of public health and through departments of education. Under proper safeguard, such funds may prove to be an asset in advancing dental health, both through the school and through other channels. Without these safeguards, these movements may prove disastrous.

Consideration of the economic difficulties and budget cuts affecting school pro-

grams today reveals that hundreds of schools, particularly in the Eastern states, will have less money to spend during the coming year than they have spent during the past year. In absorbing these cuts, a common practice is to eliminate those services more recently added to the school program. While health has been a paper objective of education for several years, in actual practice not until more recently have school health activities been a fundamental part of the educational program. We may, therefore, expect that unless action is taken in this regard, many health activities, including those related to dental health, will be either curtailed or completely eliminated from the school program. With this situation confronting school dental health education, its future, even in some states where the program has shown marked progress, is not too promising.

But to curtail these activities in the public school program, as far as the primary function of the school is concerned, is not the worst of it. This procedure provides ample opportunity for agencies outside the school to attempt, with funds available for their use, to discharge a school function—teaching—for which they are not equipped. It would also seem that this procedure will, in the end, tend only to accentuate the problem of developing sound dental health, since the teaching objective, the development of suitable dental health habits, skill and attitudes on the part of children and adults, will be lost. Dentistry, therefore, under these conditions should expect to be confronted with problems far more irritating than those it has heretofore met. Some direct efforts must obviously be made to insure more adequate support of approved dental health education and to prevent the elimination of such activities from the educational program.

In any discussion of the problems relating to the development of dental health education, my fifth point—leadership, both inside and outside the schools—must receive a share of consideration. Inside the schools, the advancement of this program is a responsibility of educational authorities. It is the duty of boards of education to provide it; and it is the duty of the administrative officer of the board of education to see that it is properly administered. The discharge of these duties, however, on the part of educational authorities needs encouragement from the dental profession. Dentists here and everywhere should see to it that school authorities devote adequate attention to this phase of the educational program. Every board of education should provide a staff, including the superintendent, that is fully informed as to the school's responsibility with regard to dental health. This staff, including the classroom teacher and the dental hygiene teacher, should be fully prepared and certified to discharge this responsibility. Without this leadership, we cannot hope for satisfactory results; and school authorities must look to the dental profession for technical advice and encouragement.

The dental profession, however, in giving this advice and encouragement should not attempt to perform the duties of school officials. Dentists should see that the responsibility for getting this work done is the educational authorities'. In some states, state-wide legislation has been proposed, making it mandatory for a board of education to provide school dentists, just as the appointment of school medical inspectors is now required by law. To follow this procedure without careful study of its implications would be disastrous. To place a dentist on the health staff of every school, even though he understands little of the primary nature and scope of the school's fundamental function in this field of endeavor, might seem, under ordinary circumstances, to be one way of advancing the practice of dentistry in the schools. The current requirements for medical inspectors in the schools, without suitable

preparation in and appreciation of the school's functions and limitations with regard to medical service, are among the principal causes for the many objections of the medical profession to the school health program.

The dentist is an adviser on the technical aspects of dentistry, including the dental examination, and should understand fully the limitations of the school as far as dental service (not teaching) is concerned. In no case should his activities infringe on the practice of private dentistry or in any way compete with efforts of private practitioners. He need not be expected to have training in the broad aspects of the educational program, unless, of course, he is to assume larger responsibilities in the teaching process, but, without such training, the dentist should not hold that he can give advice on teaching procedure.

Contrary to experience with certain other professional groups who declare their interest in school health, the dental profession, fortunately, has been quick to sense the limits of its own domain. It has, at least in some areas of the United States, been prompt to remind school authorities that school dental health education, especially as it relates to teaching procedures, is the function of a teacher, not of a dentist. At the same time, the dental profession has, through its representatives, left no doubt that it expects to have the work done by those whose duty it is to do it.

With such problems as I have discussed pressing for solution, the dental profession should promptly declare its policy, if it has not already done so. First, what type of program does it wish the public schools to maintain? Is it prepared to take an active part in the promotion of this program? The problem of meeting the public's demands for free service has doubtless already received your attention. Likewise, some attention has been devoted to current legislative proposals for dental health service. If your profession has not already done so, it should take immediate steps to insure suitable legislation and financial support for the program that it is sponsoring through public education. It should also take steps to effect a satisfactory adjustment in school programs which are now being confronted with serious budget cuts. This program, outlined in specific steps, should be prepared and modified to meet the needs of each state and should be directed to responsible state authorities for action.

In these, as in other matters in which dentistry is concerned, the public, including public school authorities, will look to the dental profession for leadership. Indeed, the program that is adopted will reflect the thought and attention you devote to it.

SANTA CLAUS MOLDS

DENTISTS who have successfully used the Snow White and Pinocchio split rubber molds will be pleased to learn that molds of Santa Claus are now available. Christmas is just around the corner and a little four inch statue of Santa Claus

will make an appropriate gift or reward to your child patients during the holiday season. Price 50 cents. Other molds are listed on page A-36. Order from the Bureau of Public Relations, American Dental Association, 212 E. Superior St., Chicago, Ill.

COUNCIL ON DENTAL THERAPEUTICS

PRESCRIBING SUGGESTIONS

THE rational use of drugs and chemicals is an essential part of dental practice. Over a period of years, the Council has issued numerous reports designed to aid the dentist in the selection of drugs and chemicals of demonstrated usefulness. Many of these are National Formulary and U.S. Pharmacopoeia substances, listed and described in Accepted Dental Remedies, sixth edition. In order that the dental profession may use acceptable and official products, and to the best advantage, the following formulas have been suggested.

The Council appreciates the cooperation of George C. Schicks, assistant dean of Rutgers University and chairman of the Committee on Dental Pharmacy of the American Pharmaceutical Association, in the preparation of the formulas.

SERIES IX

COUNTERIRRITANT

a)

℞	Metric Approximate	Apoth. Equivalents
Iodine	1.2 gm.	gr. xviiiss
Chloroform	18.0 cc.	℥ ivss
Fl. Ext. Aconite	15.0 cc.	℥ ss
Alcohol	21.0 cc.	℥ v m. xv

M.

Sig.: Dental liniment (office use). Paint on with caution.

Note: Compound Dental Liniment of Aconite and Iodine, N.F.
Counterirritant to gingiva.
Write for Dentilin. Aconit. et Iodi Co.
Formula may be found in National Formulary VI, p. 96.
Caution: Patient should not swallow liniment.

ANTISEPTIC

b)

℞	Metric Approximate	Apoth. Equivalents
Glycerite of Phenol, N.F.	30.0 gm.	℥ i

Sig.: Antiseptic agent. Dentists use.

c)

℞	Metric Approximate	Apoth. Equivalents
Phenol	18.0 gm.	℥ ivss
Camphor	36.0 gm.	℥ i ℥ iss
Liq. Petrolatum q.s. ad.	60.0 cc.	℥ ii

M.

Sig.: Antiseptic agent.

Note: Phenol Camphoratum, N.F.
Non-irritating to mucous membrane.
Similar to Camphophenique.

SCARLET RED OINTMENT

d)

℞	Metric Approximate	Apoth. Equivalents
Scarlet Red N.F.	1.5 gm.	gr. xxiiss

Olive Oil	1.5 cc.	m. xxiii
Wool Fat	12.0 gm.	ʒ iii
Petrolatum q.s. ad.	30.0 gm.	℥ i

Sig.: Apply on denuded surface.
Note: Aids in growth of epithelium.
Write for by official title, Ung. Rubri Scarlatini N.F.
Scarlet Red Ointment.

ANTISEPTIC

e)

℞	Metric Approximate	Apoth. Equivalents
Methylrosanilini N.F.	0.9 gm.	gr. xiv
Alcohol	3.0 cc.	m. xlviii
Aquae Dest. q.s.	30.0 cc.	℥ i

M.
Sig.: Apply on infected surface.
Note: Write for by official title, Liq. Methylrosanilini N.F.
Solution Gentian Violet, Crystal Violet, Methyl Violet.
Stain removed by solution of sodium hypochlorite.

f)

℞	Metric Approximate	Apoth. Equivalents
Mercurochrome	0.6 gm.	gr. ixss
Dist. Water	10.5 cc.	m. clx
Alcohol	15.9 cc.	ʒ iv m. xvi
Acetone	3.0 cc.	m. xlviii

Sig.: Mercurochrome solution.
Note: Preoperative skin disinfectant.

ACCEPTED DENTAL REMEDIES

The Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following articles in the list of Accepted Dental Remedies.

DENTIFRICES*

Casin Tooth Paste: Composition: See Milkident Dental Cream (A.D.R., Ed. 6, p. 118).
Manufactured by The Trade Laboratories, Inc., Newark, N. J. Distributed by Casin Drug Company, Inc., New York, N. Y.

Oris Brand Tooth Paste†: Composition: See Milkident Dental Cream (A.D.R., Ed. 6, p. 118).
Manufactured and distributed by The Trade Laboratories, Inc., Newark, N. J.

Admission of an article to the list of Accepted Dental Remedies does not imply a recommendation. Information regarding the rules and work of the Council will be sent on request.

HAROLD L. HANSEN, *Secretary.*

*A.D.R., Ed. 6, p. 111.
†This product does not contain orris root (no such claims are made) and it is not to be confused with orris.

HEALTH HAZARDS IN ACETANILIDE-CONTAINING NOSTRUMS AND MIXTURES

(Continued from September Journal)

By PAUL J. HANZLIK, M.D., San Francisco, Calif.

SULFHEMOGLOBINEMIA OF ACETANILIDE

Impressions from cyanosis may be quite erroneous as to the nature of the change in blood pigment. Small concentrations of methemoglobin may be obscured by the presence of reduced hemoglobin accompanying the asphyxia. Again, the darkening of blood may be due to coal-tar oxidation products. The change in coloration may be due to sulfhemoglobin, which is now known to be formed readily after the administration of a variety of aromatic hydrocarbon compounds, but especially in the presence of sulfur in some form. When sulfur-containing diets are given at the same time, and when there are gastrointestinal upsets, especially diarrhea, sulfhemoglobinemia develops readily. Whenever gastrointestinal motility is increased, as in diarrhea, the undigested food is rushed to the large intestine, where decomposition occurs, with formation of sulfur-containing products, such as hydrogen sulfide, mercaptan and others. Absorption of these sulfur products from the large intestine occurs, resulting directly in sulfhemoglobinemia. *In vitro,* hydrogen sulfide reacts directly with hemoglobin to form sulfhemoglobin. While the causal relationship of sulfurous diets and agents to sulfhemoglobinemia has been established experimentally, that of sulfhemoglobinemia to cyanosis has been demonstrated clinically after medication with acetophenetidin, and with the new antiseptic, sulfanilamide. Indirectly, sulfhemoglobin has been suspected also in acetanilide poisoning.

Sulfhemoglobinemia was demonstrated by Todd[23] in a female patient who took headache powders containing salicylates and acetanilide and showed these drugs in the urine, but this report is not sufficiently critical to incriminate acetanilide. Somewhat more critical, but still not conclusive, was a report by Paul and Clark[24] (1935), who stated that many persons who took Bromo-Seltzer or acetanilide showed an oxygen unsaturation of the blood which they attributed to the presence of sulfhemoglobin. The unsaturation in their cases ranged from 1.96 to 28.6 per cent. One person who had taken acetanilide for fifteen years was subjected to an experiment. He was given 6 grains (0.4 gm.) of acetanilide daily, then 12 grains (0.8 gm.) daily for twenty days, or a total of 240 grains (about 16 gm.). The oxygen unsaturation of the blood at the end of the experiment was 9.6 per cent, but no methemoglobin was demonstrable spectroscopically. Spectroscopic examination in other cases showed changes in the absorption band, but not those for methemoglobin. Therefore, by exclusion, Paul and Clark postulated the presence of sulfhemoglobin. Unfortunately, the spectroscope has a low order of sensitivity for methemoglobin, since a blood content of at least 25 to 30 per cent is necessary for positive identification of this pigment, and oxygen unsaturation of the blood is not specific. Accordingly, Paul and Clark could not possibly have obtained proof of the presence of sulfhemoglobin in the majority of their patients taking acetanilide, except perhaps in the blood which showed an unsaturation of 28.6 per cent. However, their surmise that sulfhemoglobin was present in ace-

tanilide cyanosis was amply justified in the light of experimental and clinical demonstrations of sulfhemoglobin after acetophenetidin, reported thirteen years previously by Snapper.[25, 26] This may be regarded as collateral proof from a chemically related drug.

COLLATERAL PROOF OF SULFHEMOGLOBINEMIA

Snapper[25] administered acetophenetidin to dogs and demonstrated methemoglobinemia. But when precipitated sulfur was given at the same time, sulfhemoglobin was produced instead of methemoglobin. The identification of the pigments was made by spectroscopic analysis. These experiments were of a confirmatory nature for similar phenomena which Snapper[26] had observed in two patients with cyanosis after taking acetophenetidin. Snapper produced sulfhemoglobinemia in these patients, after recovery from the cyanosis, by giving them 3 gm. of precipitated sulfur alone by mouth for ten days, a total of 30 gm. The sulfhemoglobinemia was more readily produced by administering the sulfur and acetophenetidin (doses of 1.5 gm.) together. Snapper suggested that the drug sensitized erythrocytes to an action of hydrogen sulfide, which is formed as the result of medication with sulfur. He postulated sulfide formation and absorption in constipation. Snapper suggested that the frequent use of acetanilide, antipyrine and related drugs, especially in England and the United States, was frequently the cause of sulfhemoglobinemia in these countries. Whether free hydrogen sulfide circulated in the blood, under the conditions used by Snapper, and if so, how much, was not determined. However, it is known from the work of van den Bergh and Wieringa[27] that minute traces of hydrogen sulfide suffice for reaction with oxyhemoglobin to form sulfhemoglobin and that the transformation is accelerated or catalyzed by the presence of certain substances, especially simple derivatives of aniline or hydrazine. This, of course, makes sulfhemoglobinemia a non-specific phenomenon, but nevertheless important in connection with acetanilide, which is so widely exploited. Sulfhemoglobin, just like other relatively stable hemoglobins (carbon monoxide, methemoglobin, etc.), decreases the respiratory functional efficiency of the blood. Its presence in the blood may account fully for the cyanosis of acetanilide, provided conditions in persons taking the drug are favorable.

It may be concluded that cyanosis is a common feature of continued acetanilide medication, including nostrums such as Bromo-Seltzer, together with blood destruction and anemia. The dosage for these changes varies with the individual and dietary conditions. The typical blood changes are reproducible experimentally in susceptible species, such as dogs (not rodents), provided medication is continued long enough. Cyanosis, which is the result of injury to the respiratory function of the blood, may be due to production of methemoglobin or sulfhemoglobin, according to conditions. The conditions which result in sulfhemoglobinemia instead of methemoglobinemia are chiefly a sulfurous dietary or medication, and gastrointestinal disturbances, either constipation or diarrhea. Hyperglycemia, which generally accompanies asphyxia or anoxemia, as in the cyanosis of acetanilide, may automatically reconvert methemoglobin to oxyhemoglobin. But failure to use (1) proper methods for identification of methemoglobin or (2) susceptible species for investigation is as responsible for negative reports as is a postulated automatic reconversion mechanism. The discoloration of the blood may be due partly to coal-tar oxidation products, which apparently vary with the species. This may be responsible for the cyanosis in species which are naturally poor methemoglobin or sulfhemoglobin formers, and in the susceptible receiving small doses of ace-

tanilide for short periods. The effects on hemoglobin and erythrocytes, which result in depression of the respiratory function of the blood, are presumably fundamental to many systemic changes which accompany the habitual use of acetanilide or acetanilide-containing nostrums. These changes may aggravate the original symptoms, such as malaise and headache, for which acetanilide nostrums are commonly taken, thus creating a vicious cycle of serious importance to an individual's health. These other changes and their implications are, in a sense, more important than the blood changes, since the latter result in tissue and organ changes. Recently, anemia and hemoglobin and oxidation-reduction changes have been fundamentally connected with the occurrence of nervous disturbance, visceral degeneration, capillary injury, premature grayness of hair, pigmentation etc., in the subacute and chronic poisoning from another agent; namely, hydroquinone, which has some actions in common with acetanilide.[28] Thus, widespread functional and organic changes and subjective manifestations of ill-health resulting from blood injuries due to continued medication with coal-tar derivatives are not at all surprising, including addiction and its unfortunate results.

ADDICTION AND ABSTINENCE SYMPTOMS

There is no longer any doubt that acetanilide is a habituating drug. As with other habit-forming drugs, general bodily effects other than those resulting from the acute pharmacodynamic actions would be expected from acetanilide. Whether the late chronic effects should be ascribed to direct action of the drug or to the indirect effects from an impaired respiratory function of the blood and anemia is not easy to determine in individuals or in groups. Indirect actions, mediated through injured blood, are certainly difficult to escape. The summary at the end of the first section of this paper indicates the general trend of hematologic events in acetanilide medication. It is now desirable to consider the results of studies which have been concerned with general bodily effects. The physician is consulted about these first, before the blood changes are determined.

Clinically, it is not easy to connect a drug with the cause of a progressive decline in health or of vague general symptoms which are observed in many unrelated disorders. Malaise, headache, loss of appetite, gastrointestinal upsets, emaciation, dyspnea, weakness, precordial palpitation and dizziness are common to a variety of conditions. These symptoms are commonly seen in neurotic and mentally inferior patients, who are also most commonly the addicted. Able physicians, however, have ruled out other causes and accepted these symptoms, together with other manifestations, especially cyanosis, as belonging to acetanilide habituation. Particularly is this true when the chain of events links with it medication with this agent or a nostrum containing it. In human beings, craving for the nostrum or the acetanilide is too well known to require emphasis. Moreover, typical withdrawal symptoms have been observed in acetanilide habitués and have been reproduced experimentally in susceptible animals.

Payne,[21] particularly, has demonstrated correlations of cause and effect in both humans and dogs. Abrupt withdrawal of the drug from acetanilide habitués resulted in three or four days in restlessness and excitement. The administration of a small amount of acetanilide (0.3 gm.) produced a completely quieting effect on a maniac, an effect which could not be duplicated with other drugs, such as barbital or morphine. Two dogs, which had been habituated to daily administrations of acetanilide, reacted with acute mania on sudden withdrawal of the drug. Epileptiform attacks with clonic convulsions, incontinence of urine and feces and unconsciousness occurred. During the administration of the drug, the dogs, like

humans, were apathetic and mentally sluggish. Since these results were limited to two dogs, transfer of results and general application to man must be made reservedly. Nevertheless, the fact that addiction and withdrawal symptoms, identical with the human being could be definitely reproduced in all particulars in a susceptible species is of greater significance than negative results in an unlimited number of non-susceptible species. It is right here that most recent studies fall short; that is, in the choice of wrong animals for experimentation with acetanilide. Yet it is the fallacious results of such experimentation that have been commercially exploited by manufacturers of acetanilide-containing nostrums; that is, rodents, such as white rats, white mice and rabbits, have been used, but these animals do not react to acetanilide with the characteristic blood changes, which, as already indicated, are probably the first to occur in susceptible species (human beings and dogs). Since the early blood changes may mediate the central nervous changes for addiction and tolerance, rodents are not suited to demonstration of the latter phenomena, as the results would be negative. This is exactly the case, as the following discussion will show.

Using white rats, Stanton and Agricola[29] reported recently that they could not produce addiction and accumulation in these animals receiving enormous doses of acetanilide gastrically. No increased irritability followed withdrawal of from 6.25 to 62.5 per cent of the minimum fatal dose, and no cumulative effects after daily administration of 1.25 per cent of the fatal dose. The drug appeared to have been completely absorbed from the alimentary canal in both rats and rabbits. True, tolerance in rats of progressively increasing doses, which could produce sedation and analgesia, was demonstrated. However, the anoxemia of methemoglobinemia or sulfhemoglobinemia accompanying acetanilide medication in susceptible species, and which probably promotes the development of instability in the central nervous system, does not occur in rodents. Severe anemia would probably tend to depress the higher functions and thus promote tolerance, as appeared to have been the case in these rats. However, abstinence symptoms in susceptible species may occur early and long before severe anemia. Furthermore, the experimental method used by Stanton and Agricola appears to have given negative results as to addiction with such well-known habituating and tranquilizing drugs as the barbitals, and peculiar and unexpected effects with morphine and codeine.[30] Therefore, the choice of white rats for such tests is questionable; for certainly in monkeys and dogs, many of the manifestations of human addiction and habituation to several narcotic drugs have been reproduced by Tatum and his co-workers.[31] White rats generally exhibit a high tolerance for drugs of all kinds, and they do not react with manifestations of anaphylaxis. The central nervous system of the rat is of a lower order of development than that of the dog or monkey. Negative results with rats, therefore, are of little or no value in the problem of acetanilide addiction. Of course, the negative results of Stanton and Agricola are in contrast with the positive results of Payne, who used dogs; but, as already pointed out, dogs are more susceptible to acetanilide than rats. In fact, dogs are more susceptible to other coal-tar derivatives and to poisons generally, also to anaphylaxis, including the blood changes resulting from acetanilide medication.

SYSTEMIC AND HEMATOLOGIC EFFECTS IN RODENTS UNDER DIFFERENT CONDITIONS

Some interesting though questionable deductions have been made from dosage experiments on rodents. For instance, Smith and Hambourger[32] reported no tolerance in white rats in which fever was produced by injections of yeast. The

antipyretic dose of acetanilide in these febrile rats was 12.5 mg. per kilogram, which reduced the temperature 0.6 degrees C., a slight antipyretic effect. These authors reported a therapeutic ratio of 64 for the acetanilide in rats; that is, 50 per cent of the fatal dose, or 800 mg. per kilogram, divided by 12.5 mg., the antipyretic dose. However, it does not follow that the fatal dose in a febrile rat would be the same as in a normal rat. It might be just one-fourth, just as 50 mg., or the temperature-lowering dose in normal rats reported by these authors, is four times the antipyretic dose of 12.5 mg. in experimentally febrile rats. Accordingly, the fatal dose in a febrile rat might be only 200 mg. per kilogram and, therefore, the therapeutic ratio would be only 16 (200 divided by 12.5) and not 64 as claimed by Smith and Hambourger. Actually, the febrile rats were more sensitive all around than the normal. Finally, repeated injections of yeast extracts may affect the physiologic functions in general and influence the pharmacologic actions of acetanilide, but this was not considered by Smith and Hambourger. Whatever the significance of these results on febrile rats, it is clearly unwarranted to use them as a basis for therapeutic or non-toxic claims under entirely different conditions. Unfortunately, such results are confusing, if anything, and not particularly clarifying in the problem of acetanilide addiction in non-febrile individuals, many of whom are otherwise practically normal.

In a study of the effects of continued medication with acetanilide on growth and blood in rats, Smith and Hambourger[33] reported that more than one-fourth the acute fatal dose of the drug given daily for some weeks was necessary to produce signs of chronic toxicity. This is not surprising in view of the now known lack of susceptibility of these rodents to this drug; in fact, to drugs in general. It took 400 mg. per kilogram of rat daily for something like six to thirteen weeks to produce some anemia; i.e., to reduce the hemoglobin and erythrocytes and increase the reticulocytes. Methemoglobin and sulfhemoglobin were not detectable. There were no abstinence symptoms, in agreement with Stanton and Agricola, and no tolerance, contrary to Stanton and Agricola. Less than 400 mg. per kilogram appeared to be innocuous. Many of the rats were fed the high daily dosage of 0.4 gm. per kilogram of body weight for about one-sixteenth the span of life, or the equivalent of about 68 gm. (over 2 ounces) daily for a 70-kg. man (140 pounds) for nearly four years; when anemia, but not cyanosis, might be expected. Now, this is a quantity and a period far beyond those necessary, or those stated in clinical reports of addiction or intoxication. However, all of this merely proves the well known non-susceptibility of rodents to acetanilide. But it is a serious omission by well-intentioned investigators, when interpreting their experimental results.

In a similar study of white rats with the combined constituents of Bromo-Seltzer, namely, acetanilide, sodium bromide and caffeine, Smith and Hambourger[34] reported essentially negative results on growth and blood. Enormous daily doses were used, when these are considered in terms of human medication; that is, 50 per cent of the fatal dose of acetanilide daily per kilogram of rat for long periods was represented in these experiments. Further discussion of these results is not necessary as they are obviously irrelevant to human medication. They are interesting only as indicating that rats can tolerate enormous quantities of the drugs making up Bromo-Seltzer, regardless of any influence of one constituent on another.

That medication with Bromo-Seltzer or acetanilide alone does affect the blood of human beings is shown clearly in a report by Lowy and Helms,[35] contrary to certain opposed interpretations by these reporters. Five patients, used by Lowy and Helms, were given 11 grains (0.7 gm.) of acetanilide daily (three

doses in one hour) for six days a week for seven to 21 weeks, either in mixture with the ingredient drugs of Bromo-Seltzer or alone. The total dosage is uncertain. Definite blood changes occurred as indicated by reductions of hemoglobin from 4 to 22 per cent, of erythrocytes from 11 to 36 per cent and of leukocytes from 19 to 70 per cent. The authors appear to disregard the importance of these positive effects, which they claim were fleeting and reversible. No methemoglobin could be demonstrated with the spectroscope, which is inconclusive. The reporting of positive injury to blood by these authors is of more than ordinary interest, as it emanates from an interested source, despite the denial of its importance. The results are, of course, consistent with experimental results in sensitive animals and with the clinical results.

In still another study of the antipyretic and toxic effects of the combination of drugs in Bromo-Seltzer, Smith and Hambourger[86] reported that the combination indicated some mutually protective action against the undesirable properties of one or another drug. Combinations of acetanilide and sodium bromide were found to be less toxic (fewer fatalities) than combinations of acetanilide and caffeine, the minimum fatal dose of bromide being 3.5 gm., and of caffeine, 0.2 gm. per kilogram. Combinations of acetanilide, bromide and caffeine were less toxic than predicted on the assumption that their effects were additive. Caffeine raised the temperature of febrile rats and antagonized the antipyretic action of acetanilide. All this is only of academic interest, as it deals with large fatal doses in an insensitive and non-susceptible animal, the significance of which for therapeutic medication it would be difficult to interpret. Moreover, acetanilide is not used as such, or in nostrums, for its antipyretic actions. Therefore, again, this work is irrelevant to acetanilide in human medication, although, unfortunately, it has been exploited in defense of claims for Bromo-Seltzer.

Sodium bicarbonate is sometimes combined with acetanilide, allegedly to promote solubility and absorption of this analgesic and to reduce toxicity and renal irritation. However, Smith[87] found that the bicarbonate, in a ratio of 2 to 1 of acetanilide, did not prevent the anemia and reticulocytosis in white rats. This mixture reduced by 20 per cent the fatalities with a 60 per cent fatal dose of acetanilide, but so small a reduction in mortality from a border-line dose is not significant. Smaller and higher ratios were ineffective, which throws doubt on the specificity of the 2:1 ratio. The bicarbonate did not affect the dosage for body temperature changes of normal and febrile rats.

Somewhat in the same dubious state are the results on white mice reported by Higgins and McGuigan,[88] although commercial propaganda has twisted them in support of claims for harmlessness of acetanilide and Bromo-Seltzer. These authors reported that very large daily doses of acetanilide (325 mg. per kilogram) and of caffeine (65 mg. per kilogram) were without effect on the growth or the health of mice. Very large doses had only the effect of slowing growth, and small doses had no effect. This is not surprising for rodents, which are not particularly susceptible, although certain of the results of Higgins and McGuigan may be given a different interpretation as regards comparative toxicity of caffeine and acetanilide. For instance, when the mice were fed 0.25 per cent acetanilide in food for seventy-four days, they gained in weight 165 per cent, and when fed 0.5 per cent, 158 per cent; while the controls on unmedicated food gained 230 per cent. In other words, there were losses of 65 and 72 per cent, respectively, due to administration of acetanilide. When the mice were fed 0.25 per cent acetanilide and 0.1 per cent caffeine for twenty-four days, they gained 63 per cent; while those on caf-

feine alone gained 176 per cent, again a considerable loss due to administration of acetanilide, the injurious effect of which was reduced by the caffeine. While of course the doses per kilogram of body weight were large, and beyond the therapeutic, mice are not to be regarded in the same category as humans, and much less should healthy mice be compared to sick people who might use these drugs. Perhaps the only real value of these results on mice is a demonstrated injuriousness of acetanilide in a non-susceptible animal which is not benefited or protected by a popularly supposed, and exploited, corrective adjuvant drug; namely, caffeine. In some rabbits, Higgins and McGuigan found that intravenous injection of acetanilide suspended in acacia (which may have had a protective colloidal influence) were not injurious to the heart, and the fatal doses were high. What significance may be attached to the reported sympathetic depression from such large doses of acetanilide and caffeine as were used in rabbits it is impossible to state, except that it is not applicable to human medication.

Following the work of Higgins and McGuigan with mice was further work with these animals by Fantus, Dyniewicz and Dyniewicz,[39] with the idea of checking the claims regarding the action of alkaline salts on the toxicity of acetanilide. With 4 per cent acetanilide in food, the total fatal dose of acetanilide became greater the smaller the amount of it consumed daily, because the mice lived longer. Actually, the amount was 1,840 mg. per kilogram of mouse daily, equivalent to 1,840 grains daily for an adult man. Mice receiving 2 per cent acetanilide in food ingested a total of 317.5 mg. and lived an average of eleven days; hence, they consumed daily 1,443 mg. per kilogram of body weight. Life was prolonged to about three times the average length and the total consumption was increased about two and one-half times by decreasing the daily consumption of acetanilide 50 per cent. Of course, all the mice died. In fact, they were ill before death, as they ate less and less acetanilide. Stating doses in the manner of these authors is unusual, but it does make impressive the dosages of the drug.

However, these are meaningless for the more sensitive humans. Administration of solutions of sodium citrate or bicarbonate to mice that were taking acetanilide with food permitted consumption of larger quantities of acetanilide, i.e., about 70 per cent more of bicarbonate and 55 per cent more of citrate than when acetanilide was fed without an alkaline salt. Whatever the significance of these results may be, a correct interpretation is impossible without additional evidence, although it is to be noted that all the mice died. The data do not necessarily have the same significance, if any, in man, in whom the physiologic economy of alkali reserve, respiration and body temperature are different. The significance of an increased toxicity of acetanilide in the presence of saponin also is not clear. Mice are not commonly chosen by experienced pharmacologists for experimentation with drugs as these animals are known to be extremely variable and capricious in their reactions, even more so than rats and rabbits. For instance, unless their body temperature is kept constant and under control, their physiologic reactions fluctuate enormously and may be meaningless for a problem under investigation. Breeds and strains of mice must also be kept in mind, as some react more than others, and still others not at all, to poisons and pathologic phenomena. Therefore, results with acetanilide on these rodents are quite as misleading as those on rats, contributing little or nothing to leading questions on the problem of mass medication of people.

(To be continued)

COMMITTEE ON LEGISLATION

JUDICIAL CONSTRUCTION OF DENTAL LIABILITY INSURANCE COVERAGE

By LESLIE CHILDS, Indianapolis, Ind.

CONCEDEDLY, dentists, in common with physicians and surgeons, are peculiarly liable to accusations of negligence or malpractice at the hands of disgruntled patients. And, irrespective of the merits of such charges—they are frequently without basis in fact—when they culminate in actions at law, obviously they must be defended; and often at substantial cost, regardless of outcome.

The question then of whether to carry liability insurance covering such situations is worthy of consideration by dentists generally. And, assuming that the dentist answers in the affirmative, he may well familiarize himself with the terms of any policy purchased, to the end that they may be complied with. The importance of care here is illustrated in United States Fidelity & Guaranty Co. vs. Fridrich, 123 N.J.E. 437, 198 Atl. 378.

THE FACTS IN THE CASE

Here, the defendant, a practicing dentist, took out a dentists' liability policy with the plaintiff for the year September 1934 to September 1935. In form, the policy was designated as "special dentist's liability policy for members of the New Jersey State Dental Society." As to representations, the defendant, among other things, subscribed to the following:

"I agree that this policy applied for shall be based upon the following statements and agreements: '(b) I am a member in good standing of the New Jersey State Dental Society.'" In addition, section 6 of the policy stated that "termination of the membership shall immediately cancel this policy."

It appears that the policy was renewed twice, for 1935 to 1936 and for 1936 to 1937. Under the second renewal term, in November 1936, the defendant was sued by a patient for damages growing out of the extraction of a tooth. The plaintiff was notified and, in accordance with the terms of its policy, undertook the defense of the action.

Here, in its investigation of the case, the plaintiff ascertained that the defendant was not "in good standing" with the state dental society when the action arose, because he had failed to pay his annual dues for the year 1936. According to the rules of the society, this, it seems, automatically suspended him from a good standing status. Upon making this discovery, the plaintiff filed the instant action for the cancellation of the policy; which, of course, would relieve it from all liability thereunder.

At the trial, it developed that the plaintiff issued two classes of dental liability policies: one class to members of dental societies, and one class to non-members; and that the defendant had carried a non-member policy prior to the issuance of the policy in question after he had joined the society. On the foregoing state of facts, the court, in stating the defendant's position, and in finding for the plaintiff, in part, reasoned:

> It is contended by the defendant that the representation made by him that he was a member of the New Jersey State Dental Society must be considered as referring to his status at the time of the making of the application and not as to the time of any renewal or renewals of the original policy. . . .

A contract of liability insurance such as this is limited to members of the state dental society. It is sold at a less premium than a like policy to non-members. The insurer believes dentists who are members of the state dental society are a better class of risk than non-members. The evidence tends to show that this thought is justified in that expert testimony is more readily available in the defense of a malpractice suit for a member than a non-member. . . .

In the instant case both parties contracted for a certain status, i.e., membership in the state dental society, and the insurance was to cover members and non-members. This the insured, the defendant in this case, was fully aware of, as is evidenced by his letter making application for the insurance at a reduced rate by reason of the fact that he had become a member or was "affiliated" with the state dental society.

The defendant contended that his statement as to his membership status was a representation and not a warranty. From which, he argued that the plaintiff, to prevail, must establish that he accepted the renewal with knowledge that he was not in good standing with the intent to deceive the plaintiff. In reply to this, the court, among other things, said:

It is true that the defendant represented and did not warrant that he was a member in good standing. He says that at the time of the issuance of the renewal he was not aware that he had been automatically dropped from good standing by reason of non-payment of dues, and that he had no intent and could have had no intent to deceive the complainant [plaintiff] by his acceptance of the renewal.

The answer to this argument, if any is necessary, is that the defendant was charged with full knowledge of the by-laws, rules and regulations of the state dental society of which he was a member and was charged with full knowledge that if he did not pay his dues within forty-five days from January 1 he was automatically suspended. . . . Decree for complainant [plaintiff].

So ended the case, with the defendant, dentist, denied the protection of his policy. And, on the facts of record, it is difficult to see how the court could have decided other than it did. Clearly, the defendant was not protected during the renewal term of the policy, during which the action against him arose, because he was not a member in good standing of the state dental society, as required by the policy; a point which the defendant appears to have overlooked. Another case of this class is Betts vs. Massachusetts Bonding & Insurance Company, 90 N.J.L. 632, 101 Atl. 257.

DENTIST'S POLICY COVERED ACTS OF ASSISTANT

In this case, the plaintiff, a practicing dentist, took out liability insurance that covered both his acts and those of any "assistant of the assured while acting under the assured's instructions." The policy contained a number of conditions, among them one noted as "B": "The company shall not be liable under the policy for any claim against the assured or any assistant arising from the violation of any law or ordinance on the part of the assured."

While this policy was in force, the plaintiff, it appears, employed as an assistant a dentist from another state who was not licensed in the plaintiff's state. This assistant was allowed to perform dental operations in the absence of the plaintiff. As the result of an operation performed by the assistant, the plaintiff was sued for damages by a patient. The patient recovered a judgment against the plaintiff. The latter paid it, and then brought the instant action against the defendant, insurance company, on the policy here involved for reimbursement. In reviewing the record and in denying the plaintiff any recovery, the court, in part, said:

The appellant [insurance company] was entitled to rely on the safeguards which the law erected against improper and illegal practice of dentistry, which tends to lead to error, mistake or malpractice. The record . . . establishes . . . that [the defendant's

assistant], both unlicensed and unregistered to practice dentistry, did, as an assistant to [the plaintiff] . . . and in the absence of [the plaintiff], perform several dental operations. . . . These acts were clearly in express violation of the statute. . . .

[The assistant's] acts, being both unlawful and unauthorized, and not having occurred while acting under the assured's instructions . . . cannot, therefore, operate or create any liability on the part of the insurance company to indemnify the [plaintiff].

Besides this conclusive bar to the respondent's [plaintiff's] right to a recovery, condition "B" of the policy of insurance expressly provides that the insurance company shall not be liable under the policy for any claim against the assured or any assistant arising from the violation of any law or ordinance on the part of the assured. . . .

We think also that the respondent [plaintiff] is debarred from recovering on the policy, because it appears that the basis of his claim of recovery is the unlawful act of [the assistant] in which the respondent [plaintiff] participated by holding [the assistant] out as a licensed dentist to the public and to the appellant [insurance company].

The foregoing cases constitute apt illustrations of judicial reasoning in the construction of liability insurance contracts covering the practice of dentistry. Of course, these cases were decided in the light of their facts, in connection with the particular provisions of the policies under consideration, as all action of this kind must necessarily be decided.

However, this in no way detracts from the value of the reasoning, and holdings announced, based thereon. And here it is plain that a dentist is bound, at his peril, to understand and comply with the coverage conditions of any policy he may carry. Otherwise, the protection value under such a policy—which indeed may be great upon occasion—may, even unwittingly, be lost.

1520 East Tenth Street.

DENTAL ECONOMICS

DO DENTAL HEALTH PROGRAMS IMPROVE DENTAL CONDITIONS?

By J. F. OWEN, D.D.S., Lexington, Ky.

IN presenting a paper before this group on "Do Dental Health Programs Improve Dental Conditions?" it is my hope to show that a dental health program is worth while.

Certain economic problems present themselves, but economic conditions alone do not prevent people from taking their children to the dentist. Many factors are involved and we must consider our problem with these factors in mind.

When I became interested in the public health phase of dentistry ten years ago, one of my first dreams was to measure results, which, it became evident, was impossible. We could look into the mouths of the children and see the results of dental care, but to actually point to any definite figures was impossible.

I further realized that if any dental health program was to take its proper place in a general health program, we must have some basis of analysis. With this thought, several years ago a ques-

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tionnaire was prepared and sent to two counties that were identical in many ways, but not in dental service.

Later on in this paper, I shall discuss conditions in these counties more or less in detail, but, in passing, may I say that one of them had been conducting a dental program for ten or twelve years under the auspices of the local dentists. In the other county, dental leadership was lacking. Therefore, this survey was not enough, since it lacked many of the requirements for a comparison.

Two years ago, I became acquainted with a lost permanent tooth index and immediately I saw the possibilities of this method of evaluating a given program. Up to that time, most evaluating methods were based on the number of cavities present per child. This is all very well, but to examine all of the school children within a given state and to do it properly would take considerable funds. In the past, we had been examining children, but doing nothing about it.

No doubt, improvements can be made, but, up to this time, the lost permanent tooth index appears to be the best means that has been devised and it is quite

LOST PERMANENT TOOTH INDEX

City..... Age of pupils.....

School..... Grade of pupils.....

Number of Children Examined	Number of Children Having Previously Had Permanent Teeth Extracted in the Following Numbers:								Number of Children Requiring Extraction of the Following Number of Permanent Teeth:								Number of Children Having Either or Both—Extracted Permanent Teeth or Permanent Teeth Requiring Extraction	Totals
	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7		
Totals																		

TABLE 1.—DATA ON COUNTIES

County	Total Examined	Missing Permanent Teeth Per Cent	Missing Permanent Teeth Per Hundred	Population	Wealth Per Capita	Area Miles	Number of Dentists
A	371	29.6	51	18.060	$1,253.00	304	5
B	287	20.0	35	17,640	1,376.65	265	9
C	241	9.5	30	26,295	738.85	435	10
D	693	27.9	55	47,400	669.26	239	22
E	310	14.5	33	11,072	406.25	253	3

No doubt, improvements can be made, but, up to this time, the lost permanent tooth index appears to be the best means that has been devised and it is quite

TABLE 2.—DENTAL REPORT, VAN LEAR (KY.) SCHOOLS, 1927-1928*

School	Examined	OK	Cavities, Permanent Teeth	Extractions, Permanent Teeth	Cavities, Deciduous Teeth	Extractions, Deciduous Teeth	Defective Teeth, Total
Number 5 Grades 1-2-3-4	133	17	144	30	303	100	577
Lower grades 1-2-3	48	4	51	5	93	20	169
Central grade 1	61	5	37	8	212	50	307
2	46	6	35	2	141	33	211
3	49	7	71	7	86	25	189
4	48	5	71	8	71	17	167
5	64	8	108	13	56	10	187
6	43	10	82	14	14	1	111
7	26	8	38	6	2	6	52
8	33	6	73	8	27	1	109
High school	73	14	158	26	00	2	186
Totals	624	90	868	127	1,005	265	2,265

*By L. B. Wolfe

TABLE 3.—DENTAL REPORT, VAN LEAR (KY.) SCHOOLS, 1935 AND 1936

School	Examined	OK	Cavities, Permanent Teeth	Extractions, Permanent Teeth	Cavities, Deciduous Teeth	Extractions, Deciduous Teeth	Defective Teeth, Total
Number 5 Grades 1-2	54	7	9	000	127	21	157
3-4	51	12	8	3	59	14	84
5	32	13	16	000	13	1	30
Central grade 1	39	12	4	000	79	12	95
2	53	15	17	000	104	15	136
3	47	12	6	000	70	15	91
4	46	12	10	3	22	3	38
5	38	18	12	000	30	2	44
6A	33	14	16	1	7	1	25
6B	33	17	17	000	16	4	37
7	52	28	39	000	3	3	45
8	45	23	37	000	000	000	37
High school	126	73	58	4	000	000	62
Totals	649	256	249	11	530	91	881

adequate for our purposes. Perhaps we do not use it exactly as intended by the originator, but I shall describe it as we use it.

In the compiling chart, shown herewith, it will be noted that the left side indicates the number of children who have previously had permanent teeth extracted. On the right side is shown the number of children requiring extraction of permanent teeth. In our surveys, we have combined both charts for the reason that we are trying to show the need for dental corrections. In our original examination, we did not combine them.

For comparison, Table 1 includes the data on five counties within the state. I shall analyze these under the headings of A, B, C, etc. This survey is based on the mouths of seventh and eighth grade students and the record was made as follows: total number of children examined in each school, the number having lost permanent teeth and whether they had lost one, two or more permanent teeth.

It would be difficult to make a thoroughly accurate analysis of the information obtained without first subjecting these figures to a statistical sampling test. A personal knowledge of the dental educational activities carried on in these various counties will permit a reasonably accurate discussion on the trends or tendencies established by the figures compiled in the survey. Each county will be considered separately.

County A: The percentage of missing teeth was higher in this county than in any of the other counties considered.

TABLE 4.—DENTAL EXAMINATIONS, VAN LEAR (KY.) SCHOOLS*

School	Examined	OK	Cavities, Permanent Teeth	Extractions, Permanent Teeth	Cavities, Deciduous Teeth	Extractions, Deciduous Teeth	Defective Teeth, Total
Number 5							
Grades 1-2	31	6	10	00	70	2	82
3	12	2	5	00	20	6	31
4-5	17	7	7	1	3	1	12
Central grade							
1	27	3	2	00	100	14	116
2	29	3	7	00	68	9	84
3	33	9	10	00	60	9	79
4	33	13	31	00	26	2	59
5	39	22	17	1	7	00	25
6	45	21	22	1	4	1	28
7	39	23	21	2	3	2	28
8	34	21	12	00	1	1	14
High school	121	65	108	8†	00	00	116
Totals	460	195	252	13	362	47	674

*For the school year 1938-1939, completed January 26, 1939; L. B. Wolfe, assisted by Miss Boone, public health nurse, and Miss Castle and Miss Stambough.

†Seven of the eight were in children who had entered this school this year. One girl had five of the seven.

The per capita wealth of the county is the second highest of all counties considered. Three facts probably have a decided bearing on the high percentage found in this county:

1. There has never been any definite or large scale dental educational program conducted in the county.

2. There are few dentists in proportion to the population.

3. A large percentage of the population is of the poorer tenant type, on tobacco plantations. The number of missing teeth per hundred children is also relatively high.

County B: The percentage of missing permanent teeth in this county was relatively low. This county is very similar to County A in population, type of population and per capita wealth. There is a greater number of dentists in proportion to the population. However, this fact, coupled with the fact that there has been continuously in operation for the past nine years a rather intensive clinical and educational dental program, probably explains this difference in percentages.

County C: The percentage for this county is extremely low as is the number of missing teeth per hundred children. The number examined was much lower in proportion to the total population in this county than it was in other counties. The number of dentists relative to the population is not so great as in some of the other counties. This low percentage may be a reflection of an extensive clinical program conducted in this county a few years ago. The wealth is probably rather evenly distributed in this county, as it is a prosperous agricultural county.

County D: The percentage in this county was high. The relation of the number of dentists to the population compared favorably with that of other counties. The per capita wealth, however, is very low and the wealth is not evenly distributed. Until the past year, there had been no extensive dental program of any sort. The high percentage of teeth missing might also be attributed in part to the low financial status and the high percentage of persons in the indigent group.

County E: Surprisingly enough, the percentage in this county was very low in spite of the relatively few dentists and the rather low per capita wealth. There has, however, been an active health program in this county for some time and this program has included from time to time a more or less extensive clinical and educational dental program. This is the only explanation for the low percentages found.

In the first part of this paper, I said that we had sent a questionnaire to certain counties. The A and B counties on this chart were the ones the questionnaires were sent to several years ago. You will note that County A has five dentists and County B nine. They have nearly the same population, also nearly the same per capita taxable wealth. I am familiar with these two counties. They have a city of similar size in about the center of the county. As stated before, the conditions are as nearly identical as they could possibly be. However, we found, in our original questionnaire, that the income per dentist in County B was greater than in County A.

From our original questionnaire, we also found that a small percentage of each dentist's practice in County A was for children; whereas, in County B, a very much larger percentage of each dentist's practice was for children. Now the question is "Why?" The answer might be given in just one word or two: "Dental leadership." It might be stated also that these are adjoining counties. Dental leadership in County B is alert. For a number of years previous to sending this questionnaire, the local dentists had been taking care of a number of indigent children through a dental clinic. Further than this, they were taking care of a number of others in their

own offices. The result of all this was that the people in this county were conscious of the importance of dental care. Leadership in County A was satisfied to sit still and do nothing about their own problem.

The lost permanent tooth index shows this difference very conclusively in the percentage of missing permanent teeth and the number of missing teeth per hundred children. This is a very good illustration from the standpoint of the economic side of children's dentistry. We find five men in a community barely making a living. We find nine men in a community of nearly the same size making a better living. We submit these facts and figures believing that there are many communities within the United States where local dentists can not only render a service but help themselves as well.

To further prove to this group that something can be done in any community, I shall briefly present figures given to me by a local dentist. Picture, if you will, a coal mining district far in the mountains where the wealth is almost nil. Picture further a lone dentist in this community trying to serve his people, with children's dentistry in mind.

I am presenting three tables showing conditions over a period of ten years. Table 2 shows 624 children with 2,265 defective teeth, or 3.64 cavities per child. These tabulations were made yearly and the examiner has been sending the data to me each year.

The school population remained practically the same until 1937, at which time it dropped to 581. Last year, it dropped to 460. The table for the year of 1935-1936 shows a total of 649 children with 881 defects, 1.2 cavities per child. After the school year 1935-1936, the mining community dispensed with the services of a nurse for the follow-up work, and the dentist had to rely on the teachers in the school for the necessary follow-up work the next year, with a resultant increase in cavities per child. The last examination covered 460 children, as shown in the table, with 1.46 cavities per child.

These tables tell a story all their own. There was a progressive reduction of the number of cavities per child each year until 1935, then a slight increase, showing definitely that a dental program can be used in any community to the advantage of both the people and the profession.

There is a greater demand for dental service today than ever before in the history of the world. The public is coming to understand what good dental care means to them and their interest in it is increasing.

The data presented are, in my opinion, conclusive evidence that dental health programs do improve dental conditions in a given community. At the present time, it is not possible to reach all the children in a given state with either an educational or a corrective program. With a proper distribution of the dental profession, much more could be done. We must correct, by some means, before we can hope to prevent. Some facilities, therefore, must be provided to care for the dental needs of the school child. In many communities, the local dental profession can do this, provided aid is given to promote a dental health educational program. As I stated in a recent paper read before the American Public Health Association, "The one thing as to which my conviction is firm is that the dental profession should at least guide and direct all dental health activities."

800 Fayette Bank Building.

NEWS ITEM

REQUEST FOR AID IN IDENTIFICATION

CHARLES W. KEMP, sheriff of Clallam County, Port Angeles, Wash., has requested the publication of the accompanying photographs of a denture which was in the mouth of an unidentified body of a woman found floating in Lake Crescent, Washington, 17 miles from Port Angeles, July 6. The body, which had been in the water from five to twelve months and was wrapped in gray-black striped camp-style blankets, was that of a woman between the ages of 35 and 45, 5 feet, 5 or 6 inches tall, weighing from 135 to 150 pounds, with dark brown hair.

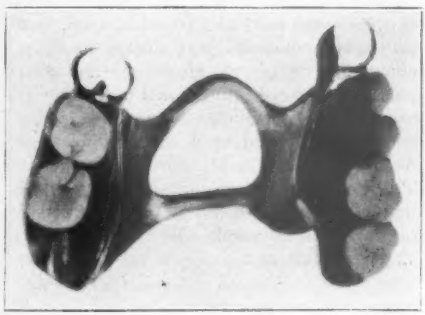


Fig. 1.—Exterior palatine view of partial denture.

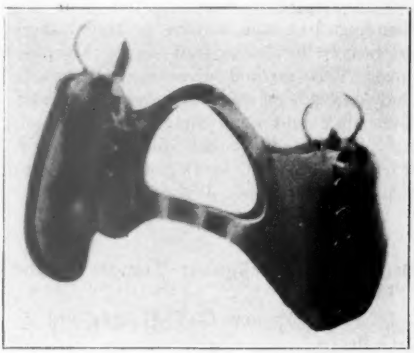


Fig. 2.—Interior palatine view of partial denture.

Following is a description of the denture furnished by the sheriff (Figs. 1 and 2):

"Partial upper denture swung from upper right bicuspid and upper left cuspid. Right side has two true-bite teeth; left side has four teeth, two molars, and being a close bite, it has been necessary to replace the two bicuspids without occlusal surfaces. Lower cuspid teeth were used instead of bicuspids in the replacements. Palate of case is cast gold; saddles put on with brown vulcanite, and pink facing. Upper left first bicuspid had been knocked out and replaced. Saddles worn by scrubbing; retention of gold on inside of plate worn down and exposed; ten years or more old from the surface wear. Casts are of cast clasp; one on bicuspid is a very heavily constructed clasp with occlusal stop on distal. Clasp on lingual of cuspid clasp covers at least third of tooth structure and has no occlusal stops or rests. Casting of the palate of the gold section extends only up to beginning of rugae and back as far as soft palatal area, making a palate approximately inch in width with the center section open. It is not an Akers design case."

Any help in identifying this body will be appreciated by the legal authorities of Clallam County, Washington, and properly rewarded.

CURRENT LITERATURE

Application of Dental Molds to Radium Therapy

By Louis J. Levinson and Nathan Peck

In the treatment of oral neoplasms, molds are often necessary to hold the radium applicators in place. Levinson and Peck found that they could get very serviceable appliances by the following technic. A compound impression of the jaw was taken and a stone model made. To this model, shellac baseplate was adapted and then trimmed and reinforced with compound. The area involved by the neoplasm was outlined on the compound, which was warmed, and the radium applicators were inserted. The surrounding area can also be protected more extensively by placing lead foil on the appliance. This method gives the operator a study model of the case before starting, saves time and gives an appliance that is easily tolerated by the patient.—*Am. J. Roent. & Rad. Therap.*, 44:303, August 1940.

E. C. Woods.

Benign and Malignant Tumors of the Jaw

By F. R. Spencer, C. F. Hagner and W. C. Block

Today, otolaryngologists are examining the mouth with greater care than was the custom a few years ago. Some are interested and well qualified in oral surgery. In this article on tumor of the jaw, the authors give a brief review of the literature and a complete report of nineteen cases. The age of the patients reported varied from 2 weeks to 81 years. In this series, sixteen of the patients were male. The type of tumor varied, thirteen being carcinoma, one fibrosarcoma, two giant-cell sarcoma, one dentigerous cyst, one sublingual cyst and one a malignant growth of undetermined origin. Only eight patients were operated on, many cases being inoperable. It was interesting to note that of these tumors, only one occurred in the upper jaw. All the patients were admitted to the hospital for diagnosis and treatment. Those with malignant tumors were made more comfortable, and their lives prolonged by the use of radium and roentgen therapy. —*Arch. Otolaryngol.*, 32:200, August 1940.

E. C. Woods.

Dental Molding, Compound Cast and Adhesive Strapping in Rhinoplastic Surgical Procedure

By Gustave Anfricht

Joseph, of Berlin, the father of modern nasal plastic surgery, used no casts after his operations, only light gauze pads held in place by adhesive straps. Anfricht used this method for years, but once in a while had trouble from hematoma. He tried all types of splints and casts and found that the most satisfactory material was dental modeling compound. After an operation, this compound is warmed and pressed over the nose to a thickness of about 3 mm. This is then trimmed to the desired shape, lined with flannel and held in place by adhesive tape. This makes a splint that is easily made, light and firm and distributes pressure evenly to the parts involved.—*Arch. Otolaryngol.*, 32:333, August 1940.

E. C. Woods.

A Critical Review of Recent Histologic and Other Researches

By A. W. Wellings

The question of the actual derivation of the primary and secondary enamel cuticle appears as yet to be debatable. In addition, the possibility of the permeability of the membrane by certain salts and oral fluids is reviewed from the point of view that Nasmyth's membrane is a dialyzing membrane. The solubility of this structure is at variance in the minds of different workers. Kronfeld was of the opinion that it is readily dissolved in acids, while others believe that it is keratinous and highly resistant to acids.

Much confusion also exists as to the structure and function of the enamel-forming cells, and about such matters as intercellular and interprismatic substances, source and

existence of prism sheaths and Tomes processes. Enamel is coming more and more to be considered as a secretion product and the ameloblasts are regarded as secretion cells. The accepted theory of enamel structure is that it is prismatic, the prisms being formed within a sheath and united by an interprismatic cement substance.

Numerous investigators have demonstrated with remarkable clarity that nerve fibers do penetrate the dentin. Some fibers have been found to accompany the dentinal fibril and others to be located extratubularly and even to enter the enamel. That there are three different types of fibers involved in the transmission of impulses has been quite satisfactorily demonstrated.—*Proc. Roy. Soc. Med.*, **38**:563, July 1940.

A. PEARSON.

Mediopalatine Bones

By M. F. ASHLEY-MONTAGU

ANOMALOUS osseus elements in the palatal vault of the human being are among the rarest of all such cranial anomalies. These accessory bones usually appear along the median suture of the palate. In most of the cases reported, the skulls were of Italian origin. It is concluded that the mediopalatine bones probably owe their origin to supernumerary centers of ossification, originating in the maxilla.—*Am. J. Phys. Anthropol.*, **27**:139, June 1940.

E. C. WOODS.

Oral Conditions of Children in Relation to State of General Health and Habits of Life

By REIDAR F. SOGNNAES and RUTH L. WHITE

A STUDY was made on two groups of infirmary outpatients, 4 to 13 years of age. These groups were selected entirely on the basis of freedom from caries (Group 1) and high frequency of caries (Group 2). A detailed dental examination and medical and nutritional studies were made in both groups. Group 2 presented a complex of pathologic manifestations, including inflammation of the gums, malformation of the jaws and irregularity of the teeth, as compared with the normal oral conditions found in children of Group 1. It is suggested that the formation of the enamel organ as well as the subsequent dental development can be influenced by nutritional deficiencies and other disturbances during pregnancy, and it was further emphasized that the period of infancy and childhood is of utmost importance for the proper development of the teeth and their surrounding tissues. The authors conclude that oral conditions may be regarded as a symptomatic complex of the general health of the body.—*Am. J. Dis. Child.*, **60**:283-303, August 1940.

JAMES T. GINN.

Speech Rehabilitation Following Excision of the Tip of the Tongue

By OLLIE BACHUS

THE author presents an interesting case of speech defect in a boy 10 years of age which resulted from surgical intervention following radium treatment for an extensive lymphangioma of the tongue. The lip sounds p, b, f, v, m and w were substituted for all consonant sounds. By careful training, these speech defects were entirely corrected. The author concludes that this case does not imply that all defects of speech caused by oral deformities can be cured, but it does suggest that many speech conditions which are considered hopeless will respond favorably to the skilful use of the technic of speech rehabilitation.—*Am. J. Dis. Child.*, **60**:368-370, August 1940.

JAMES T. GINN.

A Fatal Case of Monocytic Leukemia with Ulceration and Sloughing of the Soft Palate

By CLIFFORD EVANS

A LABORER, aged 47 years, married and healthy, appeared for treatment of "quinsy" of the left tonsil, of five weeks' duration. The diagnosis was resolving peritonsillar abscess that had discharged spontaneously. Appropriate treatment was given. A week later, the patient returned, seriously ill and complaining of dysphagia. Sloughing had occurred over the swelling of the soft palate, and the appearance of the upper part of the tonsil lesion suggested Vincent's infection.

The patient was admitted to the hospital and the blood examination gave the correct diagnosis. The Wassermann reaction was negative. The red blood count was 1,000,000; hemoglobin, 32 per cent; color index, 1; white blood count, 16,000; polymorphonuclears, 2 per cent; monocytes, 12 per cent;

primitive wandering cells, 86 per cent. The liver was slightly enlarged, but the spleen and lymph glands were not palpable. The patient's condition grew worse rapidly and he died eighteen days later. The case is interesting because the oral lesion was the only one present on the skin or mucous membrane.—*J. Laryng. & Otol.*, 55:284-285, June 1940.

E. C. WOODS.

Lupus Erythematosus, with Case Report

LUPUS erythematosus is an inflammatory dermatosis characterized by marginal red patches, covered by grayish adherent scales. The author describes briefly the two types of the disease, the discoid and the diffuse or migrating lesions, and the oral manifestations associated with it. It involves the mucous membrane and lips in both types. The oral lesions of lupus erythematosus may be confused with those of leukoplakia, but observation of the skin lesions associated with the former condition will make the differentiation clear. The etiology of this disease is unknown and the treatment is more or less empiric. Gold and sodium thiosulfate have been used with some success. A case report of a discoid type in an enlisted man is presented.—*U. S. Navy M. Bull.*, 38:395-398, July 1940.

JAMES T. GINN.

Gunshot Wounds of the Face and Jaws; First Aid Treatment, Field Service

By R. A. STOUT

IN treating gunshot wounds of the face and jaws, the three most important measures are (1) control of hemorrhage, (2) clearance and maintenance of an airway for respiration and (3) stabilization of the parts. In controlling hemorrhage about the face and jaws, digital pressure, if possible, is the best until more effective means can be applied. In hemorrhages from the extremities, a tourniquet can be applied; but not so with wounds in the head region.

Severe wounds of the face and jaws frequently interfere with respiration. Fragments of bone, fractured teeth, fillings, broken dentures, etc., may drop to the posterior part of the mouth and throat. Obstructions should be removed immediately to assure an adequate airway. All foreign bodies having been removed, attention should be given to the immediate control of bone fragments or soft tissues which may drop back into the throat.

In stabilizing the parts, simple measures should be applied to maintain the bone segments in position, so that function may be restored. Lateral segments of the mandible can be easily stabilized by intramaxillary fixation. If injury to the maxilla causes a distal displacement, a simple extra-oral method of traction can be employed.

First aid treatment must be simple, conservative, effective and quickly accomplished, with the greatest possible regard for the patient's comfort.

In most jaw cases, owing to recurrence of hemorrhage or blocking of the airway, the patient should be transported on his side or stomach.—*Mil. Surgeon*, 87:247, September 1940.

ARTHUR F. FISHER.

Vincent's Disease Treated with Nicotinic Acid

By J. D. KING

IT has been found that in patients with pellagral glossitis and stomatitis, the bacteriologic findings are practically identical with those of Vincent's infection. This prompted the use of nicotinic acid in the treatment of this condition. The author cites four cases treated thus with excellent results.

The author attempted to infect himself and a monkey with material taken from a patient with ulceromembranous gingivitis. Growth was sustained in abundance for a short interval, but no inflammation or ulceration developed indicating a possible constitutional factor.

Urinary excretion of nicotinic acid was also studied in patients, four of whom had healthy gums and one Vincent's infection. The normal cases all showed higher percentages than the one with gingival infection.—*Lancet*, 2:32, July 13, 1940.

A. PEARSON.

Vitamin C Requirements of Native Mine Laborers

By F. W. FOX, L. F. DANGERFIELD, S. F. GOTTLICH and E. JOKL

TO determine the possible effect of the increase of ascorbic acid in the diet on the physical efficiency, dental condition and blood and urine vitamin C levels, two groups

of men were used, 950 in each. The control group was maintained on the usual diet, while the test group had their diet supplemented with 40 mg. of ascorbic acid in the form of an orange juice concentrate. Throughout, the groups were selected in such a way that age, tribal distribution and general physical condition were as closely comparable as possible.

At the end of the seven-month test period, both groups were found to have maintained a high state of health. Twelve cases of scurvy occurred in the control group and one mild case in the test group. Weight changes in both groups were practically identical. Resistance to general and dental infections was not increased.—*Brit. M. J.*, 2: 143, August 3, 1940.

A. PEARSON.

Adsorption of Fluorides by Enamel, Dentin, Bone and Hydroxyapatite as Shown by the Radioactive Isotopes

By J. F. VOLKER, H. C. HODGE, H. J. WILSON and S. N. VANVOORHIS

USING radioactive fluoride as a tracer, the adsorption of fluoride by calcified tissue was studied. Enamel, bone, dentin and hydroxyapatite were found to adsorb fluorine according to the Freundlich absorption isotherm. Small but detectable amounts of fluorine were shown to be adsorbed on intact enamel surfaces. The maximum amount of fluorine adsorbed on a single tooth was of the order of 0.02 mg. It is suggested that the local application of fluorides to teeth might add sufficient fluorine to the enamel surface to decrease its susceptibility to dental caries.—*J. Biol. Chem.*, 134:543, July 1940.

J. F. VOLKER.

Cancer of the Mouth

By H. E. MARTIN and E. L. SUGARBAKER

THE authors have reported their findings in 103 consecutive and unselected cases of cancer of the floor of the mouth. In this study, it was found that approximately 17 per cent of all intraoral cancer occurred in the floor of the oral cavity. The average age of the patients was 61 years, with a range of 36 to 81 years. Most important was the discovery that 98 per cent of the cases occurred in men. In all but 15 per cent of cases, the tumors were found to originate in the anterior portion to the side of the midline and in close proximity to the submaxillary ducts. No correlation could be established with the use of tobacco, the wearing of ill-fitting dentures or syphilis as an etiologic factor, but leukoplakia was observed in 25 per cent of cases. Pathologically, 75 per cent of the neoplasms could be classified as epidermoid carcinoma, Grade II. The net five-year cure rate in these cases, all of which were treated by radiation, was found to be 25 per cent.—*Surg. Gynec. & Obst.*, 71:347, September 1940.

J. F. VOLKER.

Color Perception in Dentistry

By J. M. DYCE

THIS paper discusses the fundamentals for selecting the proper colors of artificial teeth. Among the factors that must be taken into consideration are the age of the patient, the color of the lips and the complexion, which may be dominated by yellow, red, gray or black. Several recommendations are given for selecting teeth in color harmony with the surrounding and adjacent parts of the mouth. Colored illustrations accompany the article.—*Brit. D. J.*, 69:52, July 1940.

R. F. SOGNNAES.

Cereals and Rickets. X. The Availability of Phytic Acid Phosphorus

By C. H. KRIEGER, R. BUNKFELDT and H. STEENBOCK

THE availability of the phosphorus of phytic acid, as compared with that of inorganic sources, was studied in young rats. In no case was the utilization of phosphorus from phytic acid equal to that of inorganic phosphorus. By the addition of vitamin D, the utilization of phosphorus from phytic acid was markedly enhanced. This effect was less marked with inorganic phosphorus. —*J. Nutrition*, 20:7, July 1940.

R. F. SOGNNAES.

Transition of a Civilian Dentist to a Dental Officer

By R. W. FORCE

THE author writes this article especially to dentists who expect to join the Army Dental Corps and also to the younger members of the Dental Reserve Corps.

The chief difference between private practice and army practice is the individualistic idea. In private practice, a dentist may

strive for the best technic and materials. In the Army, the health of the men is safeguarded by treatments so standardized that all troops will receive adequate dental attention. This immediately excludes certain costly and complicated procedures, such as gold and porcelain inlay work.

In private practice, a patient usually goes to a dentist because he believes that this dentist is superior to others in that locality. In the Service, the patient is ordered in for examination and work.—*Mil. Surgeon,* 87:141, August 1940.

ARTHUR F. FISHER.

The Roentgen Diagnosis of Cancer of the Accessory Sinuses

By G. E. PFAHLER and J. H. VASTINE, 2D

To think of the possibility of cancer of the accessory sinuses is the first essential in making the diagnosis. One or many of the following signs and symptoms should suggest cancer of the nasal and paranasal cavities: (1) a sense of fulness in the nose—partial or complete nasal obstruction, usually unilateral; (2) nasal discharge—either mucopurulent or serosanguineous; (3) pain—headache if the superior anatomical section is involved, and neuralgia if the alveolus or the floor of the antrum is involved or if the fifth nerve or its branches are involved; (4) fetid odors, if necrosis or ulceration is present; (5) change of the nasal tones of the voice, due to nasal obstruction or blocking of the antrum; (6) loss or alteration of the sense of smell; (7) in late stages, expansion or destruction of bone, due to pressure atrophy or invasion by the tumor, with swelling of the face, swelling of the alveolus, and loss of the teeth; (8) invasion of the orbit producing such signs as exophthalmos and proptosis; (9) ulceration of the tumor in naris, giving rise to hemorrhage; (10) invasion of the skin with edema and later ulceration; (11) local extension to the base of the skull, with consequent neurological symptoms; (12) metastasis to the regional lymph nodes, causing dysphagia and dyspnea; and (13) distant metastases, producing symptoms which vary with the site. Most of these signs and symptoms are encountered late in the disease.

Unfortunately most diagnoses are made late, and therefore in most cases the condition is incurable. At this time the clinical diagnosis is often obvious, and the roentgenological diagnosis may be characteristic, based on increased density of the sinuses or nares; expansion or destruction of bone; and an irregular outline of the soft tissues shown by opaque mediums. Consequently, in such a serious disease every possible means of diagnosis must be utilized. This includes the careful taking of this history, thorough clinical observations, and a thorough roentgen investigation, with an adequate number of projections and detailed study. Finally, a biopsy is essential for the early diagnosis.

Cancers involving the accessory sinuses vary in their distribution and characteristics according to the types, which the authors describe at length. The treatment and management will vary with these types. In some cases, irradiation alone will give the best results. In other cases, a combination of surgical or electrosurgical measures and irradiation will give best results. Individual consideration is absolutely necessary in each case, in which the type of disease and its location, extent, and duration, especially, must be taken into consideration.—*Arch. Otolaryngol.,* 31:561, April 1940; abstr. *Surg. Gynec. and Obst.,* 71:244, September 1940.

N. D. FABRICANT, M.D.

Life Expectancy and Mortality from Skin and Lip Cancer

By S. PELLER

IN order to estimate the life-shortening rôle of skin and lip cancer one can depend less on the causes than on the frequency of death and on the time elapsed since the onset of the illness. In this paper such an attempt has been made. The author studied 715 cases; all were included, whether treated or not.

The following conclusions are made:

At the onset of the disease, carriers of an epithelioma of the skin or lip are about as old as the average of all other cancer patients. At the time of death they are older. The influence upon the life expectation and mortality depends on the age at onset. Patients with skin and lip cancer less than sixty years old had in the author's material an increased mortality and a shortened life expectancy, as compared with the average population at the same age. Patients with onset of the epithelioma at ages above

seventy years had a lower mortality and a higher life expectancy.

At the beginning of the "cancer age," at forty, the total group of future carriers of a surface cancer have most probably a future life surplus, compared with the total population of the same age. This indicates that the primary internal cancers developing in those who already have or have had surface cancer are not frequent enough to diminish the life expectancy in this group or to frustrate the value of therapy of the surface malignancies.—*Am. J. M. Sc.*, 199:449, April 1940; abstr. *Surg. Gynec. and Obst.*, 71:98, July 1940.

J. K. NARAT, M.D.

Relief of Symptoms of Major Trigeminal Neuralgia (Tic Douloureux)

By H. BERSOOK, M. Y. KREMERS and C. G. WIGGINS

PRESENT palliative treatment of trigeminal neuralgia is, on the whole, unsatisfactory, and adequate surgical therapy is not available to many sufferers with the disease. Knowing that the polyneuritis of chronic alcoholism and of pregnancy has been effectively relieved by vitamin B, the authors have been using massive vitamin doses for the relief of major trigeminal neuralgia.

The treatment may be divided into two parts: (1) active therapy, consisting of intravenous injection of 10 mg. daily of thiamin chloride and (2) modification of the diet, consisting of a high vitamin—low carbohydrate intake, usually supplemented by 1 ounce daily of an aqueous concentrate of rice polishings, which provided 1,500 international units of vitamin B. About 25 per cent of the patients studied failed to respond until liver extract (15 U. S. P. anti-anemia units per cubic centimeter) was given intramuscularly three times weekly. Fifty-eight patients with tic douloureux were treated with large doses of vitamin B and, in some cases, with concentrated liver extract. Thus far, thirty-seven are markedly improved, fifteen improved, three slightly improved and three not improved. These patients have been under observation for from six to fourteen months. Of four patients with sphenopalatine neuralgia, two were markedly improved and two improved. In nine cases of atypical facial neuralgia, there was possible moderate improvement in three and no improvement in six.

The authors report great variation in the speed at which different patients respond to this treatment. Of the fifty-eight studied, nine were markedly improved after one month, nine after two months and eleven after three months. Some cases showed no improvement until from four to six months of treatment. In the course of recovery, relapses commonly occurred. These became progressively less severe and of shorter duration.

The treatment is available everywhere. It can be administered by any practitioner and, with some instruction, even by the patient himself.—*J.A.M.A.*, 114:1421, April 13, 1940.

M. K. HINE.

Effect of Fluorine on the Activity of Vitamin D in Rachitic Rats

By K. MORGAREIDGE and S. B. FINN

WHEN fluorine is added to a rachitogenic diet, there appears to be a decrease in the severity of the rickets as indicated by an increase in density of the bones to the x-rays and, more particularly, a decrease in width of the metaphyseal zone of hypertrophic cartilage. Vitamin D promotes the healing of this "fluorine rickets," although in a somewhat atypical manner. Administration of fluorine simultaneously with vitamin D, seems to inhibit the healing process in rats not previously subjected to fluorine poisoning.—*J. Nutrition*, 20:75 July 1940.

R. F. SOGNNAES.

The Dental Surgeon with Combat Troops

By J. H. JAFFER

THE author tells of his experience as a dental officer in the last war. Most people, among them members of the dental profession, believe that dentists are called to service to care for the teeth of the Army personnel in either some convenient, comfortable training camp or a hospital. Though this is true to a certain extent, a great many dentists accompany the combat troops into action.—*Mil. Surgeon*, 87:7, August 1940.

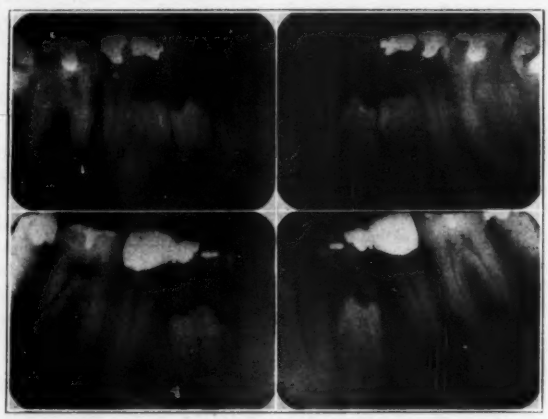
ARTHUR F. FISHER.

INCIDENTS OF PRACTICE

Supernumerary Teeth

By J. R. Horn, D.D.S., New York, N. Y.

A man, aged 23, height 6 feet and 9 inches, who was mentally subnormal, gave a history of removal of a supernumerary permanent tooth. Roentgen-ray examination revealed seven bicuspids in the lower jaw. There was no pain.



Supernumerary teeth.

Should Unerupted Teeth Be Removed?

By Albin W. Rauch, D.D.S., Newark, N. J.

Following is an unusual and interesting, but not rare case of an unerupted third molar affecting the general well-being.

An unerupted upper left third molar was revealed during the routine roentgenographic examination of a woman aged 34, March 3, 1936. At that time, the patient had the condition here reported on the upper right side and complained of pain on the right side. The third molar was removed; but since there were no complaints relative to the condition on the left side, nothing was done about the upper left third molar.

During the summer of 1939, the patient, while on a vacation, experienced pain on the left side and consulted a dentist, who suggested the removal of the first molar. The patient, in her report to me, described a recovery of about three weeks' duration (probably a case of dry socket) and the gradual development of a pain in the right shoulder, elbow and hand, with, by October 31, almost complete loss of function of the right arm. Before referring to me, she consulted a physician, an osteopath and a chiropractor, none of whom gave her any relief. On her visit to me, a roentgenogram was taken of the upper left third molar area and removal of the tooth was carried out immediately under local anesthesia.

The removal was very simple, but, on examination, the tooth proved to be an imperfectly formed fourth molar fused to the lingual side of the third molar, a condition which was not evident in the roentgenogram. The patient was instructed to apply ice for

half an hour to the outside of the face on arriving home. She telephoned the morning following the operation and reported that she had experienced no pain or discomfort in the face up to that time and that the right arm began to feel normal six hours after the operation. November 6, there was complete healing of the wound, with almost normal function of the right arm.

CONCLUSION

While there may be no infection around unerupted teeth, their retention beyond the age when they should normally erupt may cause a physical disturbance, manifested, as in this case, by pressure on nerves, which would not ordinarily be associated with the teeth.

11 Isabella Avenue.

Tooth Fusion

By MATTHEW POMMER, D.D.S., Wilkinsburg, Pa.

A WOMAN, aged 40, complained of severe tooth ache and a pain behind her ear, the latter pain having been present for several months. Roentgenogram showed a second molar exposed and fused to an impacted third molar. The pain behind the ear disappeared after extraction and uneventful healing took place.

906 Wood Street.

Incisor with an Attached Infected Cyst

By GEORGE GOLDSTEIN, D.D.S., Saratoga Springs, N. Y.

AN upper right lateral incisor measuring 1 inch in length had attached an infected cyst measuring seven-eighths inch. (Fig. 1.) The cyst came out in its entirety during the extraction and was found to contain more than one-half ounce of pus. Despite the extensive amount of bone destroyed, the adjoining teeth were not affected. Recovery was uneventful.

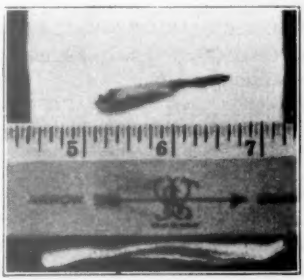
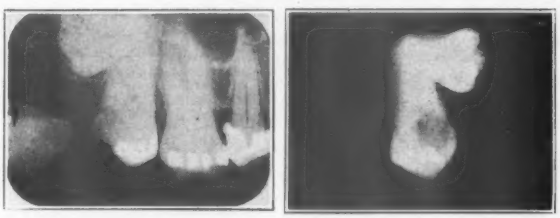


Fig. 1.—Tooth and cyst.



Tooth fusion.

412 Broadway.

ANNOUNCEMENTS

ANNOUNCEMENTS must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

CALENDAR OF MEETINGS

ALPHA OMEGA FRATERNITY, Baltimore, Md., December 29-31.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF ORAL DIAGNOSIS, October 17-18, New York, N. Y.

AMERICAN DIETETIC ASSOCIATION, New York, N. Y., October 20-24.

AMERICAN PUBLIC HEALTH ASSOCIATION, Detroit, Mich., October 6-11.

AMERICAN SOCIETY FOR THE ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY, New York, N. Y., October 28.

UNIVERSITY OF BUFFALO DENTAL ASSOCIATION, Buffalo, N. Y., October 8-10.

CHICAGO DENTAL SOCIETY, MIDWINTER MEETING, February 17-20, 1941.

DISTRICT OF COLUMBIA DENTAL SOCIETY, second and fourth Tuesdays in each month from October to June at the United States Public Health Service Auditorium, Washington.

GREAT LAKES ASSOCIATION OF ORTHODONTISTS, Toronto, Canada, October 28-29.

GREATER NEW YORK DENTAL MEETING, Hotel Pennsylvania, New York, December 2-6.

GREATER PHILADELPHIA ANNUAL MEETING, February 4-7, 1941.

NATIONAL BOARD OF DENTAL EXAMINERS, December 2-3.

UNIVERSITY OF NEBRASKA DENTAL COLLEGE ALUMNI ASSOCIATION, Lincoln, October 25-26.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA, Pittsburgh, October 15-17.

ST. LOUIS (MO.) DENTAL SOCIETY (MIDCONTINENT DENTAL CONGRESS), October 27-30.

STATE SOCIETIES

October

Southern California, at Los Angeles

November

Florida, at St. Petersburg (11-13)
Ohio, at Cincinnati (25-27)

February (1941)

Minnesota, at Minneapolis (25-27)

April (1941)

Massachusetts (14-17)
Oklahoma, at Oklahoma City (27-30)

May (1941)

Georgia, at Savannah (19-21)
Illinois, at Peoria (12-15)
Louisiana, at New Orleans (1-3)
Virginia, at Old Point Comfort (5-7)

STATE BOARDS OF DENTAL EXAMINERS

California, at San Francisco, December 16. Kenneth I. Nesbitt, 515 Van Ness Ave., San Francisco, Secretary.

Connecticut, at Hartford, November 19-23. C. G. Brooks, 302 State St., New London, Recorder.

Indiana, at Indianapolis, October 28. J. M. Hale, Mt. Vernon, Secretary.

New Jersey, December 9-14. Walter A. Wilson, 148 West State St., Trenton, Secretary.

Ohio, at Columbus, October 28. Morton H. Jones, 1553½ North Fourth St., Secretary.

Pennsylvania, at Philadelphia and Pittsburgh, December 10-14. Reuben E. V. Miller, 61 North Third St., Easton, Secretary.

South Dakota, at Sioux Falls, January 24-27, 1941. C. H. Boyden, Mitchell, Secretary.

Texas, at Dallas, December 9-12. B. Carl Holder, 1009 Nixon Bldg., Corpus Christi, Secretary.

Wisconsin, at Milwaukee, December 16-20. S. F. Donovan, Tomah, Secretary.

ALPHA OMEGA FRATERNITY

THE annual convention of the Alpha Omega Fraternity will be held at the Belvedere Hotel, Baltimore, Md., December 29-31.

EMANUEL HOFFMAN, *Publicity Manager*,
827 West 36th St.,
Baltimore, Md.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF ORAL DIAGNOSIS

THE two-day meeting of the American Association for the Advancement of Oral Diagnosis, October 17-18, in the New York Academy of Medicine Building, New York, N. Y., will come at the end of the first week of the Graduate Fortnite of the Academy. Prominent members of the dental and the medical profession will participate in the programs as clinicians, essayists and discussors, covering subjects of common and practical interest to members of both professions.

A dentomedical exhibit on oral and physical diagnosis will be presented during the meeting, stressing the significance of early and correct diagnosis in the field of prevention and the importance of periodic examinations, enabling those who visit the exhibit to obtain important and practical suggestions that can be applied in the everyday practice of dentistry and medicine. Members of both professions who are in good standing in their respective organizations are eligible for membership.

For further information relative to membership, organizing of regional divisions, etc., communicate with the secretary, H. Justin Ross, 515 Madison Ave., New York, N. Y.

AMERICAN DIETETIC ASSOCIATION

THE twenty-third annual meeting of the American Dietetic Association will be held at the Pennsylvania Hotel, New York, N. Y., October 20-24. Many of the papers and other contributions will be of interest to dentistry and all ethical dentists are invited to attend the sessions. A detailed program can be had from the secretary, 185 North Wabash Ave., Chicago.

AMERICAN PUBLIC HEALTH ASSOCIATION

AT the annual meeting of the American Public Health Association, to be held in Detroit, Mich., October 6-11, the following sessions will be of interest to dentists:

Wednesday, October 11, 12:30 p.m. Oral Health Group, luncheon session, Ivory Room, Hotel Statler; essayist: Nathan Sinai, D.D.H.; subject: Where Is Dentistry Going in Public Health?

2:30 p.m. Joint session of Public Health Nursing Section and American School Health Association, Oral Health Group, Banquet Room, Hotel Statler (Richard C. Leonard, D.D.S., presiding); essayists: Annie J. Taylor, Joseph I. Linde, M.D., and Frank J. Houghton, D.D.S.; subject: Marshalling Community Forces for Dental Health. Discussed by Frank C. Cady, D.D.S., and Harold H. Mitchell, M.D.

Friday, October 13, 9:30 a.m. Health Officers Section; essayist: K. R. Gibson, D.D.S.; subject: Children's Dentistry.

2 p.m. Joint session of Food and Nutrition Section and American School Health Association, Oral Health Group, English Room, Hotel Book Cadillac; essayists: William R. Davis, D.D.S.: What Can Dental Health Workers Teach in Regard to Nutrition? Richard C. Leonard, D.D.S.: A Preschool Dental Service Program with Coordinated Nutritional Study. Ruth L. White: Nutrition Education in a Dental Program. Harriet Stone: Nutrition and Dental Health Education at Different Grade Levels in the Elementary Schools. Bertha Holman: Creating a Dental Consciousness Within a Community. Discussed by F. A. Pearson, M.D.

AMERICAN SOCIETY FOR THE ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY

THE next meeting of the American Society for the Advancement of General Anesthesia in Dentistry will be held in New York, N. Y., October 28, 8:30 p.m., at Midston House, Thirty-Eighth St. and Madison Ave. The dental profession is invited to attend.

M. HILLEL FELDMAN, *Secretary,*
730 Fifth Ave.,
New York, N. Y.

UNIVERSITY OF BUFFALO DENTAL ASSOCIATION

THE fortieth annual meeting of the University of Buffalo Dental Association will be held October 8-10, at the Hotel Statler, Buffalo, N. Y. The Eighth District Dental Society of the State of New York is cooperating in developing the program. All ethical practitioners are invited to register and to attend these sessions.

LEON J. GAUCHAT, *Publicity Chairman.*

CHICAGO DENTAL SOCIETY MIDWINTER MEETING

THE Seventy-Seventh Annual Midwinter Meeting of the Chicago Dental Society will be held at the Stevens Hotel, February 17-20,

1941. Members of the American Dental Society are invited to attend.

LEO W. KREMER, *Secretary,*
30 North Michigan Ave.,
Chicago, Ill.

GREAT LAKES ASSOCIATION OF ORTHODONTISTS

THE fourteenth annual meeting of the Great Lakes Association of Orthodontists will be held at the Royal York Hotel, Toronto, Canada, October 28-29.

RICHARD E. BARNES, *Secretary,*
Republic Bldg.,
Cleveland, Ohio.

MIDCONTINENT DENTAL CONGRESS

THE Midcontinent Dental Congress will be held under the auspices of the St. Louis Dental Society at the Hotel Jefferson, St. Louis, Mo., October 27-30.

VAL H. FREDERICH, *Secretary,*
Arcada Bldg.,
St. Louis, Mo.

NATIONAL BOARD OF DENTAL EXAMINERS

THE National Board of Dental Examiners will hold its next session for the examination of candidates in Parts I and II, December 2-3, in schools where there are five or more candidates. For information and application, address

MORTON J. LOEB, *Secretary,*
66 Trumbull St.,
New Haven, Conn.

UNIVERSITY OF NEBRASKA DENTAL COLLEGE ALUMNI ASSOCIATION

THE next annual meeting of the University of Nebraska Dental College Alumni Association will be held in Lincoln, October 25-26.

L. LEROY WILLIS, *President,*
504 Ramsey Tower,
Oklahoma City, Okla.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA

THE Annual Fall Convention of the Odontological Society of Western Pennsylvania will be held in Pittsburgh at the William Penn Hotel, October 15-17.

JAMES M. MCNERNEY, *Secretary,*
8127 Jenkins Arcade,
Pittsburgh.

GREATER PHILADELPHIA ANNUAL MEETING

THE Greater Philadelphia Annual Meeting will be held February 4-7, 1941, at the Benjamin Franklin Hotel.

ABRAM COHEN, *Chairman,*
Publicity Committee,
269 South 19th St.,
Philadelphia, Pa.

GEORGIA DENTAL ASSOCIATION

THE seventy-third annual meeting of the Georgia Dental Association will be held at Savannah, May 19-21, 1941, with headquarters at the Hotel DeSoto.

R. H. MURPHY, *Secretary,*
Macon.

MASSACHUSETTS DENTAL SOCIETY

THE Massachusetts Dental Society will meet April 14-17, 1941.

PHILIP E. ADAMS,
106 Marlboro St.,
Boston.

ILLINOIS STATE DENTAL SOCIETY

THE next annual meeting of the Illinois State Dental Society will be held in Peoria, May 12-15, 1941. The newly elected officers are: John J. Donelan, Springfield, president; J. R. Blayney, Chicago, president elect; J. Leslie Lambert, Springfield, vice president; L. H. Jacob, Peoria, secretary, and R. W. McNulty, Chicago, treasurer.

L. H. JACOB, *Secretary,*
Jefferson Building,
Peoria.

LOUISIANA STATE DENTAL SOCIETY

THE sixty-first annual meeting of the Louisiana State Dental Society will be held May 1-3, 1941, at the Roosevelt Hotel, New Orleans.

JULIAN S. BERNHARD, *Secretary,*
417 Medical Arts Bldg.,
Shreveport.

MINNESOTA STATE DENTAL ASSOCIATION

THE fifty-eighth annual session of the Minnesota State Dental Association will be held in the Municipal Auditorium, Minneapolis, February 25-27, 1941.

L. M. CRUTTENDEN, *Secretary,*
498 Lowry Medical Arts Bldg.,
St. Paul.

OHIO STATE DENTAL SOCIETY

THE next meeting of the Ohio State Dental Society will be held at the Netherland Plaza Hotel, Cincinnati, November 25-27.

VAN B. DALTON, *President,*
116 Garfield Place,
Cincinnati.

OKLAHOMA STATE DENTAL SOCIETY

THE next meeting of the Oklahoma State Dental Society will be held in Oklahoma City, April 27-30, 1941.

O. W. BOYER, *Secretary,*
Perry.

VIRGINIA STATE DENTAL ASSOCIATION

THE next annual meeting of the Virginia State Dental Association will be held at the Chamberlain Hotel, Old Point Comfort, May 5-7, 1941.

J. E. JOHN, *Secretary,*
Medical Arts Bldg.,
Roanoke.

BOARD OF DENTAL EXAMINERS OF CALIFORNIA

THE next examination by the Board of Dental Examiners of California for license to practice dentistry and for license to practice dental hygiene in California will be given in San Francisco, commencing December 16, at the College of Physicians and Surgeons, College of Dentistry, San Francisco, and at the University of California, College of Dentistry, San Francisco. All credentials must be in the office of the secretary at least twenty days prior to the date of examination. Address all communications to Kenneth I. Nesbitt, Secretary, Board of Dental Examiners of California, Room 203, 515 Van Ness Ave., San Francisco.

CONNECTICUT DENTAL COMMISSION

THE Connecticut Dental Commission will meet in Hartford, November 19-23, for the examination of applicants for license to practice dentistry or dental hygiene and to transact any other business proper to come before it. Applications should be in the hands of the recorder at least ten days before the meeting. For application blanks and further information, apply to

C. G. BROOKS, *Recorder,*
302 State St.,
New London.

INDIANA STATE BOARD OF DENTAL EXAMINERS

THE next examination for licensure of the Indiana State Board of Dental Examiners will be held in Indianapolis beginning October 28. All applications, fees and credentials must be in the hands of the secretary not later than ten days before the examination. For applications, instructions to candidates and other information, address

J. M. HALE, *Secretary,*
Mt. Vernon.

OHIO STATE DENTAL BOARD

THE next examination of the Ohio State Dental Board will be held at the College of Dentistry, Ohio State University, Columbus, the week beginning October 28. All applications must be in the hands of the secretary at least ten days before the date of the examination. For further information, apply to

MORTON H. JONES, *Secretary,*
1553½ North Fourth St.,
Columbus.

STATE BOARD OF REGISTRATION AND EXAMINATION IN DENTISTRY OF NEW JERSEY

THE State Board of Registration and Examination in Dentistry of New Jersey will hold its annual examinations, commencing December 9 and continuing for five days thereafter. On application to the secretary, a copy of the requirements and rules, instruction sheet and preliminary application blank will be sent. Any person desiring to apply as a candidate must file the preliminary application blank, together with the examination fee of $25, on or before March 15 for the succeeding June examinations or before September 1 for the succeeding December examinations.

WALTER A. WILSON, *Secretary,*
148 West State St.,
Trenton.

DENTAL COUNCIL AND EXAMINING BOARD OF THE COMMONWEALTH OF PENNSYLVANIA

THE Dental Council and Examining Board of the Commonwealth of Pennsylvania will conduct examinations in Philadelphia and Pittsburgh, December 10-14. For information and application blanks, address the Department of Public Instruction, Bureau of

Professional Licensing, Dental Division, Harrisburg, or

REUBEN E. V. MILLER, *Secretary,*
61 North Third St.,
Easton.

SOUTH DAKOTA BOARD OF DENTAL EXAMINERS

THE South Dakota State Board of Dental Examiners will hold its next examination at the Carpenter Hotel, Sioux Falls, January 24-27, 1941. Applications should be in the hands of the secretary ten days before the date of the meeting. For further information, address

C. H. BOYDEN, *Secretary,*
Mitchell.

TEXAS BOARD OF EXAMINERS

THE Texas Board of Dental Examiners will hold its next examination December 9-12 in Dallas. Applications must be filed at least ten days prior to date of examination. For further information, address

B. CARL HOLDER, *Secretary,*
1009 Nixon Bldg.,
Corpus Christi.

STATE OF WISCONSIN BOARD OF DENTAL EXAMINERS

THE Wisconsin Board of Dental Examiners will hold its next meeting at the Marquette Dental School, Milwaukee, to examine applicants for license to practice dentistry and dental hygiene December 16-20. Applications and required fee must be in the hands of the secretary not later than December 10. Address all communications to

S. F. DONOVAN, *Secretary,*
Tomah.

EXAMINATION FOR APPOINTMENT IN THE DENTAL CORPS OF THE NAVY

A COMPETITIVE examination to select candidates for appointment in the Dental Corps of the Navy will be held December 2 at the Naval Medical School, Washington, D. C., Naval Training Station, Great Lakes, Ill., and Naval Training Station, San Diego, Calif. A candidate for appointment in the Dental Corps must be a citizen of the United States, between 21 and 32 years of age at the time of appointment, and a graduate of a standard dental college. A circular which contains full information relative to the Dental Corps and describes the method of making application for appointment can be obtained from the Bureau of Medicine and Surgery, Navy Department, Washington, D. C.

UNITED STATES PATENTS APPLICABLE OR PERTAINING TO DENTISTRY ISSUED DURING AUGUST 1940

August 6

No. 2,210,094, REINHOLD F. H. MUELLER. Device for cleaning and polishing dental plates, etc.

No. 2,210,349, PETER VAN BEECK. Instrument for extracting tooth roots.

No. 2,210,424, FREDERICK CLINTON MORRISON. Artificial tooth and method of installation of the same.

No. 2,210,483, BÖRJE FÉRON. Electric dental furnace.

No. 2,210,776, ORIL M. POLKINGHARN. Dental powder dispenser.

August 13

No. 2,211,369, CHARLES B. DURGIN. Dentifrice.

No. 2,211,537, FAIRLEIGH S. DICKINSON. Hypodermic needle.

August 20

No. 2,211,789, ALBERT S. MERRICK and PAUL H. BEIER. Refractory mold material.

No. 2,211,952, JOHN LAWRENCE KELLY. Dental instrument.

No. 2,212,116, GEORGE B. EBERENZ. Amalgam press.

August 27

No. D-122,135, HAROLD PALMER DUEY. Design for a toothbrush.